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PROCEEDINGS

OF THE

ROYAL GEOGRAPHICAL SOCIETY

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VOL. III.

SESSION 1858-9.

Nos. I. to VI.

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ROYAL GEOGRAPHICAL SOCIETY,
15, WHITEHALL PLACE, S.W.

PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

SESSION 1858–9.

First Meeting, Monday, November 8th, 1858.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*General Duncan A. Cameron,* R.E., C.B., *and the Right Hon. J. Stuart Wortley,* Q.C., M.P., *were presented upon their election.*

ELECTIONS.—*The Hon. Francis Baring; Arthur John Edward Russell,* M.P.; *Lieut. George Brine,* R.N.; *Charles Davidson Bell, Surveyor-General of the Cape of Good Hope; Aubrey De Vere Beauclerk, George G. Gilbert-Heard, J. G. Johnstone, Joseph Paul, and Theodore Walrond, Esqrs., were elected Fellows.*

ACCESSIONS.—The accessions to the Library and Map-Rooms since the last meeting were important, comprising, among others, 936 Ordnance Maps; 81 Admiralty Charts; 40 French Charts; 78 Belgian Maps; 10 Swedish Maps; 38 Native Maps of China; Stanford's large Map of Europe; the Dispatch Atlas; an account of the Principal Triangulation for the Ordnance Survey; Report of the Ordnance Survey Commission; Villavicencio's Geografia de la Republica del Ecuador; Leigh Sotheby's Principia Typographica; 11 vols. of the 'Memorie della R. Accademia Ercolanese' from the Neapolitan Government; Hydrographical Notices published by the Admiralty and the Dépôt de la Marine; the eighth edition of Maury's Sailing Directions; Meteorological Papers published by the Board of Trade; Astronomical Observations made at the Radcliffe Observatory; the Transactions of various Geographical and Scientific Societies at home and abroad, &c.

The Papers read were:—

1. *Journey through the Mountainous Districts North of the Elbúrz, and Ascent of Demavend, in Persia.* By R. F. Thomson, Esq., and Lord Schomberg H. Kerr, of H. M. Mission in Persia.

Communicated by the Earl of Malmesbury, Foreign Office.

From the Hon. C. A. Murray, c.b., *&c., H. M. Minister in Persia, to the* Right Hon. the Earl of Malmesbury, *&c. &c.*

Camp at Lar, Aug. 2, 1858.

My Lord,—I have the honour to transmit herewith a narrative of an excursion in the Elbúrz chain of mountains, and of the subsequent ascent of the lofty mountain of Demavend, lately made by Mr. R. F. Thomson, first attaché to this mission, and by his colleague Lord Schomberg Kerr. As this grand and interesting mountain range is but little known either to the general or to the scientific public in England, I would respectfully request your Lordship to be kind enough to forward the narrative, with the accompanying map and specimens, to the President of the Royal Geographical Society. I feel assured that I am truly anticipating your Lordship's sentiments when I express an opinion that the zeal, energy, and intelligence exhibited by Mr. Thomson and Lord Schomberg Kerr on this excursion, and in the graphic description of it, reflect the highest credit upon them, especially when it is borne in mind that neither of them have had the advantage of any specially scientific education, and that they have been obliged to supply, in many instances from their own ingenuity, resources which would have been easily attainable in Europe. Notwithstanding the certain amount of fatigue which they necessarily had to encounter, it is evident from their narrative, as well as from the fact of the ascent of Demavend having been lately made by two gentlemen who accompanied them, and by two members of the Russian Mission, none of whom were practised mountain pedestrians, that there is no mountain in the world, of the same elevation, the ascent of which is attended with so little risk or difficulty, its crater being at least 6000 feet higher than the summit of Mont Blanc, which, even with the aid of the skilful and experienced Swiss guides, it is generally a work of greater labour and duration to attain. Mount Ararat, which has long been considered the monarch of the great mountain chain extending over Central Asia, from the Caucasus to the Northern Himalayas, has now been dethroned by the unerring fiat of Mercury, and must be content to take a secondary place by the side of his true sovereign Demavend, who has thus recovered a portion of the long lost honours and glories assigned to him in the legend of ancient Persia.

I have, &c.,

Ch. A. Murray.

The principal object of our excursion, of which the following is a brief sketch, was to determine the exact elevation of the Peak of Demavend, a point which has never, we believe, been satisfactorily ascertained. But before doing so, we proposed making a short circuit through the mountainous districts north of the Elbúrz, a locality little frequented even by Persians, and almost entirely unknown to Europeans.

The mountains of Elbúrz, at the foot of the southern slopes of which the town of Tehran is situated, extend from the Plain of Cazvin on the west to the town of Demavend on the east, forming the division between the low belt of country on the southern shores of the Caspian and the high lands of the central province of Irāk. They are a portion of the lofty chain which branches off from the Caucasus, and after passing through Azerbijan, the North of Persia, and Affghanistan, terminates in the range of the Himalayas. The line of these mountains, though occasionally broken in Persia, especially in Khorassan, where it is intersected by several extensive plains, may easily be traced throughout the whole of this vast tract of Asia. The Elbúrz, although of enormous height, have not a very imposing appearance from the Plain of Tehran. With the exception of the huge cone of Demavend, no peak towers above its fellows, and from a distance the summit of the range seems to be nearly level. In summer the snow disappears almost entirely from the southern face, but on the northern side it remains in large quantities throughout the year. Another reason why they are wanting in the beauties of chains much inferior in height is that the highest range rises immediately out of the Plain of Tehran, throwing out scarcely any spurs, and effectually concealing the vast sea of mountains which extend in a northerly direction.

Like the generality of mountains in Persia, those of Elbúrz are but scantily clothed with vegetation, the plants growing on the slopes having a dry, blighted appearance, and, as usual, there is a total want of trees of natural growth. The colour of the rocks which form the lower part of the chain is in general a reddish brown, varied here and there by huge blocks of grey stone. For about one half of the whole height of the mountain these rocks rise nearly perpendicularly. They are jagged and broken up into deep precipitous ravines, down one or two of which small streams, fed by the melting snow and by springs, force their way into the plain. Above, the slope becomes more gradual, though still very steep, and the rocks are for the most part covered by loose gravel and earth.

If, however, the Elbúrz mountains are poor in vegetation, they are, like many other parts of this extensive range, rich in mineral productions, copper, iron, lead, and orpiment being found in large quantities. The specimens procured are not of any great purity, but having been merely picked off the surface, cannot be considered as showing what the value of the ore might be if scientifically worked. Coal, of excellent quality, is also so abundant in many districts in the immediate vicinity that an inexhaustible supply might be procured at a trifling cost for the purpose of working the mines, but the want of enterprise of the Persian people and the indifference evinced by the government to all measures of improvement, or schemes for developing the resources of the country, have hitherto caused this source of wealth to be almost entirely neglected, and the working is limited to the extraction of a small quantity of coal for the annual supply of the European residents and the blacksmiths of the capital. No parrot or cannel-coal has hitherto been discovered.

As many as five rivers, besides smaller streams, take their rise in the Elbúrz, within 25 miles north of Tehran. The largest of these is the River of Núr, which flows in a north-easterly direction, and after passing to the north of Demavend, falls into the Caspian west of the flourishing town of Amúl. The next in size is that of Talighan, which flows from the mountains of the same name, and is a tributary branch of the Sefid Rúd or White River, a large sheet of water entering the Caspian to the east of Resht.

The Heráz or Laur River, which rises near Shahzadeh Kúh, passes through the district of Laurijan to the south of Demavend, and falls into the same sea near the town of Amúl. Salmon, trout, and, near their mouths, sturgeon abound in these several rivers. The remaining two, those of Jajrúd and Kerretch, after descending into the plains of Veramin and Tehran, where a portion of their water is withdrawn by means of canals for the purpose of irrigating the lands belonging to the numerous villages with which these plains are studded, are lost in the great salt desert beyond.

Having made the necessary preparations and provided ourselves with a small tent, a set of Casella's hypsometrical apparatus, and a few other instruments procured from England, we left the summer encampment of the mission at Gulabek on the 11th of July at 5 P.M. The road from Gulabek passes to the north through the large village of Tajrish about 2 miles distant, and 1 mile farther on through Derbend, a village situated in the mouth of a narrow gorge, which is from its elevation and reputed salubrity of climate a favourite summer resort for the higher classes of Tehran. From Derbend the road becomes more difficult, passing over rocky and uneven ground until the small hamlet of Pess Kalaa (famous for its cherries and wild strawberries) is reached. This path, bad as it is, has been much improved of late years, as it leads to a cascade a little higher on the side of the mountain, which place the Shah occasionally visits during the summer months. The distance from Derbend to Pess Kalaa is about 1 mile. The latter is the last village met with on the southern side of the range of hills, and here we bivouacked for the night on a rock in the open air.

July 12*th.*—We commenced ascending the mountain at half past

4 A.M., winding over a narrow, rugged path. At about half way to the summit the ascent becomes less abrupt, and the soil of greater depth. Flowers, comprising tulips, crocus, wild lavender, and thyme, besides a variety of other aromatic plants, are to be seen in great profusion, and in many places the slopes of the hills assume a green tint. The rocks and precipices on the lower half of the mountain consist principally of limestone. No quartz was observed by us here or in any other part of the Elbúrz. At that part of the summit where the road crosses the range we turned to the right and proceeded to the highest peak, measuring 12,887 feet above the level of the sea. The peak bears due north of Tehran, of which, as well as of the surrounding plains, it commands an extensive view. On descending from this point, we passed what the Persians call "the sea of ice," a kind of glacier, from which the market of Tehran is abundantly supplied in the hot weather whenever, in consequence of a mild winter, the ordinary provision of that luxury does not suffice for the consumption of the inhabitants. Near this spot we saw a large covey of about 30 "Kebk i derri," or royal partridges (known also as the Caspian partridge), a bird equal in size to a well-grown turkey, which, we believe, is only known in Persia, and is rarely to be found excepting in the Elbúrz and some of the high lands in Azerbijan. We also observed a number of wild sheep crossing a stony ridge at some distance below us.

The road descends in a north-westerly direction to the valley of Shehristanek, shortly after which we arrived at the principal village of the district, bearing the same name. From Pess Kalaa to the crest of the mountain is about 6 miles, and thence to the village of Shehristanek 4 miles more. This valley runs as nearly as possible east and west, is about 6 miles in length, and a small stream, a tributary of the Kerretch River, flows through its bed. To the east there is another valley, that of Rudbár, opening into the district through which flows the Jajrúd River, and containing, besides some of the rich mines before mentioned, several large and flourishing villages, the most important of which is named Ahar. The two valleys are only separated by a small pass. Shehristanek is at an elevation of 7040 feet.

July 13*th*.—We proceeded down this valley, which is fertile and well cultivated, the higher slopes of the hills on the southern side being scantily covered with stunted cypress trees. At the western extremity of this district we entered the valley of Laura, its general direction being nearly north and south, and affording a channel for the Kerretch River, named "Doab" at the point of its junction with the Shehristanek stream, whence the combined waters flow for a distance of 12 or 14 miles through pathless and inaccessible mountains, entering the plain 24 miles west of Tehran. It was from the latter point that Hají Meerza Aghassi, the Prime Minister of the late King of Persia, attempted to cut a canal by which he proposed to supply the plain of Cazvin with a copious stream of water. Native engineers were employed, a vast sum of money was expended, a day pronounced auspicious by learned astrologers was fixed for the opening of this grand undertaking, the minister invited the king to attend the anticipated ceremony with all his court—everything in fact succeeded thus far, and the signal being given, the dams were cut away, when the water streamed for a few yards into the new channel, but there it stopped and still remains, the Kerretch retaining its waters and the plain of Cazvin remaining deprived of an element, the absence of which prevents it from becoming one of the most productive parts of Persia.

July 14th.—The Laura Valley, in general about a quarter of a mile broad and closed in by mountains which rise almost vertically, contains several villages, and is well cultivated throughout its whole extent. The road follows the left bank of the river and passes the village of Meidanek 3 miles from Doab: 2 miles farther on there is another village, Hassanekber, and thence to Nissa is about 2 miles more. Nissa is the principal village of the district, situated in an open valley half a mile from the left bank of the river. Opposite this village on the right bank we skirted the foot of the range of the Talighan Mountains, extending from east to west, their height being equal, if not greater than that of the Elbúrz Peak. The next and last village in this valley is Getchiser, 3 miles from Nissa. Before reaching this point the river is crossed by a wooden bridge, and a little lower down a tributary stream, nearly as large as the Laura itself, flows from a valley on the right bank. The elevation of Getchiser is 7198 feet. At Getchiser the path leaves the river and winds up a steep ravine (at the bottom of which there was still snow in large quantities) to the north-west for a little more than 2 miles, and then, turning to the east, ascends the difficult pass of the Shemlian. The mountains on either side of this ravine are curious from their extreme steepness, being at an angle of 50° or 55°. What renders them the more remarkable is the almost total absence of rock, which only here and there pierces through the thick coating of light sandy soil which slopes in a perfectly even line from the summit to the base. The elevation at the top of the pass is 9820 feet. Here the first view is obtained of the low range of hills

(161 W. of S.) covered with trees and jungle, through which the low country of Mazandéran is entered. The descent on the northern side is equally abrupt, and is also about 2 miles in length.

July 15th.—During the night a heavy dew fell, completely saturating our bed-covering. Although this dew is productive of no bad effect at this elevation, it is otherwise on the shores of the Caspian, where the natives are extremely careful to avoid exposing themselves to it at night. Our path now descended in a parallel line with a rapid stream for four miles, quitting the Mazanderan road on the left at the second mile. This route is only practicable for a few months during the hot season, and is mainly used by the villagers near Tehran, who gain a livelihood by transporting charcoal from Mazanderan to the capital. After two miles course north-east, we entered the Valley of Dúna, through which flows a small mountain stream, joining that which waters the valley we had just left; and together they dash through a magnificent ravine, guarded on either side by large precipices of red sandstone. The district of Dúna is small, containing only two villages of 60 families each. Continuing in a northerly direction, we crossed a mountain-pass, which, compared to the others in the neighbourhood, was neither high nor difficult, and thence descended into a narrow valley, at the eastern extremity of which there is one small village. The distance from Dúna is 3 miles. The valley is called Kamrman, and is the property of the present Prime-Minister of Persia. Elevation 7860 feet. A stream flows through it, which, at a distance of 3 miles north-west, forces its way to the wooded country below through a wild and narrow gorge crowned with precipices of enormous height, which, with the hills above, are partially covered with forest trees.

July 16th.—Two roads lead from the valley of Kamrman—one conducting to the valley of Núr, over a hill to the north of Shahzadeh Kúh; and the other, which we followed, taking a north-easterly direction over the range which forms the boundary between the districts of Kamrman and Núr on one side, and Mazanderan on the other. The summit of this pass shows an elevation of 10,890 feet. To the left of the road a lofty peak rises to the height of 1000 feet above the pass, and to the summit of this we went to obtain a better idea of the country we had crossed. The range we were now upon was of great height, forming the northern limit to the Elbürz chain. Looking down from its crest we saw below us a low range of well-wooded hills, cut up in several places by deep, rocky gorges, and opening in others into fertile valleys. These gradually diminish in height, and at length disappear in the low level country of Mazanderan. From this peak the Caspian Sea is visible, in clear weather, at a distance of about 26 miles; but in summer it is seldom seen, owing to the exhalations from the damp and marshy jungles on the coast, which produce a thick haze, effectually concealing the view even from heights much nearer the sea. Opposite to, and south of this point, a huge and jagged rock, which appeared to be inaccessible, in the form of a pinnacle, towers above all the surrounding mountains. It is called the Shahzadeh Kúh, or Prince's Mountain, and is considered by the natives to be the highest peak in the whole range, with the exception of Demavend. There is a tradition among them that Noah's Ark rested upon its rocky peak; and they affirm, with the fullest belief in the story, that a portion of the Ark may still be found near its summit. At the base of this mountain, the Núr and Laur, or Heráz Rivers take their rise. From this pass we crossed the range by a circuitous and rocky path, descending on the Mazanderan side of the hill to a spring of water, the temperature of which was 40° Fah., where we halted for the night. The distance from Kamrman to the top of the pass is 6 miles, and thence to the spring 4. The elevation at this spot is 9438 feet.

Beyond the Valley of Zanús, which lies immediately below, running north-east and south-west, we perceived the valley and extensive district of Kújjúr bearing E. by N. A river passes through Kújjúr, named the Shalis; which, after being joined by two streams flowing down the Zanús and Meekhsay Valleys, empties itself into the sea. We did not visit this district ourselves, but were informed by the natives that it contained numerous villages, and that its waters abound in fish.

July 17*th*.—Leaving the spring at which we had encamped, we descended by a tortuous path into the forest below. The view here was such as one seldom has an opportunity of seeing in Persia, where trees are so rare. Behind us rose the mountains we had just crossed, the grey crests of which, in the form of huge towers, stood out in bold relief against the clear morning sky. In the ravines which separated these rocks from one another the snow still lay, contrasting with the steep grassy banks which sloped away below, and giving rise to streams which leaped from rock to rock till lost among the trees on the lower portion of the mountain. Around us on all sides forest trees, including oaks, elm, maple, and fir, together with wild apple and pear-trees, clung to the steep sides of the valley, whose banks were also clothed with ferns and other plants. Descending through the valley of Zanús in a north-easterly direction, we passed a few small villages rudely constructed with branches and shingles, occupied by charcoal-burners. The distance to Zanús is 7 miles. This is a large village, within 20 miles of the Caspian in a direct line, and about 30 by the road. It contains upwards of 100 families, whose houses are built of mud and stone, with pent roofs covered with rough slates and the bark of trees. This was the northernmost point which we reached, and the elevation was lower than at any other place we passed through. Leaving Zanús, we turned sharp round to the right, following a valley which conducted us towards the same range of hills we had crossed the day before. Here are several flourishing villages, the chief of which is Meekhsay, 5912 feet above the sea level. The road continues to ascend this valley for about 5 miles, winding among rocks and forest trees. At this distance we began to climb the mountain, the path, though steep, being neither difficult nor dangerous. The distance to the summit, which is 10,561 feet in height, is about 4 miles. The jungle growth ceases at an elevation of 8500 feet.

July 18th.—Descended to the valley of Núr, through which flows the river of the same name, the course being south-easterly to the village of Ouj, distant 8 miles from the top of the pass. We next passed through the large village of Yoush, situated on the left bank of the river, and halted at the point where the Núr is joined by another large stream flowing from the south. Elevation 6539 feet. The whole of the district of Núr, of which the town of Beledeh, situated at the eastern or lower extremity of the valley, half-a-mile below the junction, is the capital, belongs to Meerza Agha Khan, the present Prime-Minister of Persia, whose family has held the property for several generations. It is populous and well cultivated, and at present derives no little importance from its being the native place of the principal functionaries under the present administration of Persia.

July 19th.—Left Núr, and followed the course of the Yalú River already mentioned. One mile from the junction we passed the village of Púlvek, where the Yalú River is joined by a considerable stream of the purest water flowing from the south-west. We proceeded up the Yalú, and after following its course between rocky mountains for some distance, we entered a small valley, containing two villages, March and Yalú, also the property of the Prime Minister. The distance to Yalú is 4 miles. Here the Yalú river again divides into two portions—one flowing from the east through a narrow ravine, and the other coming down from the mountains to the south. This latter we followed.

The mountains above Yalú are formed of a white friable stone, probably gypsum. The road, after proceeding up the left bank of the stream for about a mile, crosses it by a bridge of stone at the mouth of a dark, narrow gorge, shut in by stupendous precipices

400 feet high, between which the river rushes furiously. The path up this gorge is dangerous in the extreme: in places it traverses the face of the precipice overhanging the torrent, which one can hear as it roars and boils in whirling eddies far below; and in others, the low parapet which had been built by the side of the narrow path as a slight protection had entirely fallen away, rendering the passage perilous even to the sure-footed mules, for which Northern Persia is famous. It would be difficult, however, to find a finer gorge than that through which we were passing. After about 1½ or 2 hours, having attained a considerable height, we emerged upon an open chummun,* in which we found several camps of Eeliats, or nomades, who in summer seek these high elevations on account of the fine pasturage the mountains afford to their innumerable herds. Passing along this for about 3 miles, we came to the foot of another pass, very steep and high, and which it took us an hour and a half to ascend. Here we were caught by a thunder-storm, which however did not prevent us from taking the elevation, found to be 10,851 feet. The descent on the other side is neither so long nor steep as the ascent, but it is more rocky. Among other descriptions of rock we discovered coal of inferior quality in many places. At the foot of the pass, as on the other side, is built a wretched caravanserai, intended as a protection to travellers who may venture to cross these hills in the early spring or late autumn. To the left, descending from the rocks by innumerable falls, flowed the Sefid Aub. This waters a fine open valley, covered with grass, and everywhere dotted with the tents of Eeliats. We followed this stream for about 2 miles, when we entered the valley of the Laur River flowing from the north-west, and it being dark, we pitched our tent on its banks for the night.

July 20th.—Walked down the banks of the stream, which is fed by numberless springs, and whose sides are clothed with grass. The width of the valley is about ¾ of a mile. After about 6 miles it opens out considerably, so much so that the space almost deserves the name of a plain, being about 4 square miles in extent. After this it narrows again, the river passing between two rocks which rise immediately out of its banks. Beyond these we found the camp of Mr. Murray and the Mission pitched at a pleasant spot named Chehel Cheshmeh,† or the Forty Springs, from the numerous fountains of clear water which well up out of the rocks and the plain in every direction.

The first part of our trip was now concluded, the most important part

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* Meadow.

† Elevation, 7833 feet.

—namely, the ascent of Demavend—being still to be accomplished. The mountains through which we had passed are generally of the same description, one being much like another, and formed chiefly of limestone. Between them run valleys, very narrow, and almost entirely wanting in trees except those planted by the inhabitants, which consist of poplars, walnut, and mulberry. Barley, bearded wheat, and clover, together with enormous quantities of butter and cheese, form the staple commodities of these districts. In winter the inhabitants are unable to move out from the depth of snow which covers the ground, and they are forced to remain under the cover of their rude huts, together with their flocks and herds, for which during the summer months they lay in a large stock of grass and dried plants from the mountains.

The inhabitants, nevertheless, seem happy and contented; their isolated position among the hills no doubt leaving them free and untouched by many of the exactions and cruelties to which the better known provinces of Persia are subjected. Another cause which may add to the prosperity of some of these villagers is the constant passage during the summer of caravans of mules carrying charcoal from Mazanderan to the capital.

Game does not exist in large quantities in these mountains; several varieties are, however, met with. The Kebk i derrí, a magnificent partridge, already mentioned, we found in several places. There are besides two other kinds of partridge, the Kebk and the Teihú, in considerable numbers. Quail in abundance during the summer months, and in the autumn snipe are to be found in the valleys. Birds of prey, of great size and in vast numbers, are to be seen; they are chiefly vultures and hawks, eagles being rarely met with. Of four-footed animals the wild sheep, or mouflan, and ibex are the only remarkable ones. Hares are in some places frequently found. All the rivers in this district, with the one unaccountable exception of the Jajrúd, are well stocked with trout.

On the 24th of July, shortly after daylight, we left the Mission encampment, and proceeded for about 3 miles along the right bank of the river, which here winds down the centre of a wide grassy valley.

Two miles and a half below the Chehel Cheshmeh the Heráz is joined by a smaller stream, which takes its rise at about 10 miles distance among the mountains to the north-west of Demavend. It is named the Sefid Rúd, or White River (this name is also given to several other rivers in Persia), on account of the extraordinary milky appearance of its waters. On reaching the end of the Valley of Laur, we crossed the river, and about ¼ of a mile farther on passed over a torrent fed by the melting snows from the mountains to the north. After its junction with this stream, the Heráz dashes down a rocky ravine, whose sides are so precipitous and narrow that, even 200 feet above the level of the torrent, only a few feet intervene between one side and the other. The path here leaves the river and winds high up over the spurs of the mountain. It is rocky and difficult, being in many places almost impassable for horses. Now and then, however, we crossed fine open chummums or grassy plains, in which great numbers of mares of the royal stud were turned loose for pasture.

We had not proceeded very far before our track joined the high road, if such it can be called, which leads from Tehran by way of the town of Demavend to Ask, the capital of the district of Laurijan, and the residence of its governor.

The hot baths of Demavend, so famous in Persia, are situated in this locality. They are two in number: one, the tepid bath, is situated within 100 yards of the town of Ask, on the right bank of the river. It rises in an oval basin, measuring about 30 feet by 20, and about 3 feet in depth, formed by deposit from the spring, which gushes up with great force in the centre of the basin, together with a considerable amount of gas. The water is composed of sulphur, iron, soda, and magnesia.

The other spring, which is situated about 2 miles farther down the valley, and on the mountain of Demavend, is so intensely hot that the water has to be conducted through canals for some distance before it is collected in an artificial basin, in which the patients bathe. This water is also composed of magnesia, iron, and sulphur; but the latter is in much larger proportions, and naphtha in great quantities also forms one of the ingredients. Near Ask there is also a spring of cold water, strongly impregnated with iron. From Ask a road leads down to the town of Amúl, but it is extremely dangerous, lives being lost annually from mules and their riders falling over the precipice, along the face of which it runs.

Having on a previous occasion visited the town and hot springs, we avoided the descent into the deep valley in which they are situated by following a track which led along the face of a precipice formed of basaltic rock. The path was difficult, and in many places dangerous. After an hour of this work we came upon a level piece of ground, on which is situated the large village of Reinah.* We did not stop here, but pushed on to a point about a mile farther on, where the guides, &c. necessary for the ascent were waiting for us. The distance from Laur to this place is about 18 miles.

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* Elevation, 6618 feet.

The lower portion of the mountain of Demavend does not differ much from its neighbours. In fact, if anything, it is perhaps less steep and difficult to ascend. It consists chiefly of long high ridges, which commence at the foot of the cone, and run out for some distance, when they end abruptly. The valleys and ravines between these ridges are deep, and for the most part covered with loose stones, gravel, and earth. Here and there huge volcanic rocks pierce through the outer covering, breaking the larger valleys into ravines. Strange to say, there are but few springs on this mountain.

We commenced the ascent by proceeding up an even slope covered with large stones, between which flowers of different descriptions sprung up in great variety. On reaching the top of this slope we entered a narrow ravine of excessive steepness. In 1855, when we first made the ascent of Demavend, we found a tolerable track up this ravine, but a torrent having swept with great violence over this part of the mountain during the last winter, all traces of it had disappeared.

The ascent of this ravine was consequently painful and fatiguing in the extreme, the loose stones rolling away from under our feet at every step. Having at length gained the top, we found before us a large extent of ground covered with huge shapeless blocks of basalt, over which we made our way with some difficulty. Beyond this we had to cross at right angles a ravine filled with snow, and extremely steep. There is, however, not much danger in crossing this if caution be used, except in the early morning, when the snow being frozen, one is liable by a slip to be precipitated some hundred feet into the valley below. After this the ground becomes more practicable—it is very steep, but covered with a firm soil of reddish colour, on which plants of great variety grow in considerable numbers. Among others, we noticed the forget-me-not, wild thyme, lavender, and ferns, besides a beautiful variety of the everlasting flower, of most delicate form and colour. This plant we found at a higher elevation than any other. After a fatiguing walk of four and a half hours we reached a small tent we had before sent on, and which was pitched some distance below the foot of the cone, by a spring of water.

The elevation of this point is 12,664 feet, and shortly above it vegetation ceases. The temperature of the air in the tent was not so low as might have been expected, the mercury falling no lower than 39° Fah., but outside the cold must have been intense, for a stream which during the day flows from the melting snows above, and is both very rapid and of considerable size, was completely frozen during the night, the water appearing to have been suddenly arrested in its course, and only beginning to flow again when the rays of the sun had played for some time on the solid mass of ice.

July 25th.—For the third time we were now about to attempt the ascent of the cone of Demavend. On the first occasion we failed, being obliged to return by a storm of wind and snow. The second time we succeeded in reaching the top, but having no instruments, we were of course unable to make any observations. On the two previous occasions the mountain was much more covered with snow than we now found it to be. In fact, the guides told us that they had never seen so little remaining. Many places which before we found covered with snow to a great depth, were, though a month earlier in the season, now quite bare; and in many places even the glaciers which fill some of the ravines intersecting the mountain-side had partially disappeared.

The cone of Demavend is doubtless of volcanic origin, and appears to have been formed partially by having been forced up above the level of the mountain by some subterranean agency, but more by the débris and lava thrown out from the summit when the volcano was still in activity. From a distance it appears to be nearly smooth, and to slope evenly at an angle of about 45° from the top to bottom. On a nearer approach, however, it becomes evident that the cone consists of a number of ridges, which run from the summit to the base, leaving between them deep ravines filled in general with snow and ice, beneath which lies a mass of débris fallen from the upper part of the mountain.

At an early hour after dawn on the 25th we quitted the tent, and after proceeding for above a mile over ground covered with loose gravel and large masses of stone, reached the foot of the snow, where the cone of Demavend may be considered to commence. For about 2 hours we then climbed over rocks of lava and basalt broken up into a thousand shapeless masses, and piled in confusion one above the other. At the top of this we scrambled up a small precipice of about 30 feet, and then found before us a long ridge, perfectly even, and evidently formed by a stream of lava having run over the surface, leaving it so smooth and steep that it was somewhat difficult to keep our footing. Before leaving the tent, the guides had made us take off our own shoes, and had tied round our feet pieces of ox hide. We now found the use of this, the hide clinging tenaciously to the rock, where ordinary boots must inevitably have slipped. The ascent of this portion of the mountain was attended with great fatigue, especially as the rarefaction of the air began to tell upon our lungs. After 2 hours more we reached another precipice higher than the last. This we surmounted without difficulty, and then found to our right a precipice of enormous depth. Opposite rose another, whose rocks, however, unlike those on which we were standing, were of a reddish-yellow colour, apparently composed of sulphur and lime. The space below was filled with ice and snow. Skirting along the edge of this precipice we came, after about 1¼ hours, to Bamshí Bend, or Cats' Pass, in Mazanderaní dialect. This, though somewhat unpleasant from its great height, was this time comparatively safe and easy. On the last occasion on which we made the ascent, we were forced to cut steps in the ice with hatchets in order to obtain footing; we also took the precaution of attaching ropes in case we should fall. Now there was no ice, and but little snow. The elevation below this pass is 18,509 feet. Above this we had again to scramble over blocks of basalt such as we had met with at the commencement of the ascent. This continued for about an hour, after which, except in one or two places, the ascent was rather less steep. We now crossed a long space covered entirely with soft gravelly soil, consisting apparently of limestone and disintegrated rock of various descriptions, together with crystals of sulphur which lie about in large quantities, and of great purity. Beyond this rises the last ascent, up a steep slope, among rocks of a light yellow colour, formed of limestone and sulphur.

The last part of the ascent from the Bamshí Bend was extremely painful from the rarefaction of the air. We were attacked with nausea and violent headaches, and experienced great difficulty even when at rest in drawing breath. Monsieur de St. Quentin, of the French Mission, and M. Castelli, a Sardinian gentleman, who hearing of our intended expedition had asked to accompany us, were also attacked in the same manner. Having recovered a little from our fatigue, we proceeded to take observations of the height of the mountain. This we ascertained to reach the enormous height of 21,520 feet.

The cone of Demavend terminates in a crater about 85 yards in diameter, which is nearly surrounded by jagged rocks. These are highest on the northern and southern sides. They are not, however, everywhere of the same composition: to the north and west they are of the same basalt of which we had seen so much in ascending the mountain, while to the south and east they are composed of sulphur and lime. The basin of the crater was almost entirely filled with snow, upon which we did not venture more than a few yards, as we found that it increased in depth at every step. There are two caves near the summit, one 100 feet below the eastern side of the crater, and about 16 feet deep by 5 broad; the other, lower down to the south-east, and much smaller. From both of these caves issues a steam strongly impregnated with sulphur, which forms in crystals over the whole interior surface. Not only from these points, but from many small holes in the rocks, this steam issues in strong jets. We had intended to pass the night in one of the caves, but found it impossible to do so from the rarefaction of the air, and from the effect which the sulphuric vapours had upon us. Below the cave, and to the north-east side of the cone, there is a large glacier, at so steep an angle as to be altogether impracticable. It was smaller this year than in 1855, but the blue points of ice stretching away far below still presented a fine appearance. We had made the ascent on the south-eastern side of the mountain, and the path we had followed appeared to be nearly the only practicable one.

We were unfortunate in the day we selected for the ascent. The morning had been clear, but by the time we reached the Bamshí Bend the weather had changed, and a heavy fall of snow continued during the whole time we were at the summit, the thermometer descending to 29° Fah. in the open air. This prevented us from obtaining a view, such as we had enjoyed on our previous ascent, which was both extensive and magnificent.

We remained at the top for about an hour and a half, and then descended by one of the ravines, taking advantage of the snow, wherever we found it, to slide down.

The next day we returned to the Mission Camp at Laur by the same road which we had followed two days before.

The height of the mountain, the ascent of which we have just made, took us much by surprise. From Tehran and the neighbouring hills, though always a conspicuous and remarkable object, it fails entirely to give a correct idea of the real elevation, which is, as before stated, 21,520 feet. This can only be accounted for by the fact that between it and the observer, from this side, there exist other ranges of great height, which must necessarily have the effect of dwarfing any object behind them; and also that Tehran itself is at an elevation of 3600 feet. From Mazanderan, however, the view of this great mountain is truly grand: thence the whole of its enormous height unbroken from the summit to the base is seen, and that from a point 80 feet below the ordinary level of the sea.

It may therefore be as well to record the observations upon which we base the statement of the height of Demavend.

Tehran is known from repeated observations to be 3600 feet above the level of the sea. The instruments used were hypsometrical apparatus by Mr. Casella, 23, Hatton Garden, and the results of the observation we worked out according to the tables of heights and corrections furnished with the instruments. We, on most occasions, took the observations with more than one thermometer, but those here mentioned were shown by Casella's thermometer, No. 161, as registered and rectified at the Royal Observatory of Kew.

Station.	Boiling Point.	Hour.	Temperature.
Tehran	205·2	7 A.M.	° 76
Laur	197·8	6·30 A.M.	64
Reinah	199·9	11 A.M.	83
Foot of the Cone	189·4	6 A.M.	42
Below Bamshí Bend	179·7	1 P.M.	44

The instruments not allowing of any greater height being taken by their means, we were reduced to the necessity of boiling a common thermometer, to ascertain the boiling point at the summit. The accuracy of our observation may however be relied upon, for after carefully comparing this common thermometer with that furnished by Casella, we could distinguish no observable difference. Apart from this, we may observe, that from the point where the other thermometer was no longer available to the top we were nearly 3 hours walking, without stopping anywhere beyond what was necessary for resting, during which time we could have scarcely mounted less than 3000 feet.

The observation was taken in the cave 100 feet from the summit. The boiling of the thermometer was complete and satisfactory, we having provided ourselves with charcoal to be prepared in case of need.

In conclusion, we may mention that we do not pretend to any scientific acquirements whatever. The above is only a statement of what we saw and observed, which may however prove somewhat interesting from the fact that nearly all the country we have explored has been hitherto almost, if not altogether, unknown to European travellers.

Several specimens of sulphur from the summit of Demavend, and a few specimens of mineral found in the Valley of Rudbár, are transmitted with this paper, together with a map giving an outline of the route we followed.

The PRESIDENT.—Whatever comments may be made upon this paper, and upon the method employed to determine the height of the mountain Demavend, you will all agree with me that the greatest possible credit is due to the two gentlemen attached to Her Majesty's Mission in Persia, who have employed themselves so energetically in the furtherance of geographical science. Mr. Murray gives his young friends every credit for what they have done, and no more praise than they really deserve; and he expresses his opinion that the present communication, and the observations upon which it is founded, have deprived Mount Ararat of that superior altitude in the Eastern world which has hitherto been attributed to it. But the fact is, that geographers, particularly the venerable Humboldt, have not placed the Ararat of geographers in this category. I have looked into the last volume of 'Cosmos' to-day, and Humboldt records the height of Demavend at 19,715 feet, which is but 1785 feet under the height attributed to it by our diplomatists. According to Humboldt, Ararat is only 17,112 feet high.

General Monteith, F.R.G.S.—Having passed three years at the foot of Mount Ararat, I am well acquainted with that mountain. I used many means to ascertain its elevation, and I made it 16,000 feet above the level of the Araxes—I mean the Ararat of modern geographers, in the province of Erivan. I was not so fortunate as to reach its summit—though I attempted the ascent with several men—in consequence of the mountain being so thoroughly capped with ice. With regard to Mount Demavend, I have seen it, but did not attempt to ascend it—not from want of curiosity, but from want of time. I had the opportunity of seeing the Demavend from the summit of one of the range of mountains across the Caspian Sea. The distance from me was 248 miles, and I was at an elevation of 7000 feet at the time. I hurried down to the village to get instruments, but unfortunately I missed the opportunity of seeing the mountain again.—Near the village of Khoor, at the foot of the mountains between Ardabet and the Caspian, though I had a tent and guard for seven days, the atmosphere was never again clear of mist. The Mount of Demavend appeared to me not to be more than twice the height of the general range, and of the same I was on, which by boiling water gave 7000 feet above the Caspian. Ararat, I may say, in appearance at least, is higher than any mountain in Persia, or even the Caucasus. One-third of the mountain is buried in perpetual snow and ICE, so as to reflect a strong light like glass when the sun shines on it; in this particular it differs from any other mountain I have seen.

The second Paper read was:—

2. *Expedition from Moreton Bay in Search of Leichhardt and Party.* By AUGUSTUS CHARLES GREGORY, Esq. (Gold Medallist, R.G.S.).

8th Dec. 1857.—Having received instructions from the Honourable the Secretary for Land and Public Works to organize an expedition for the purpose of searching for traces of Dr. Leichhardt and party, who left New South Wales in 1848 with the intention of proceeding overland to Western Australia, I proceeded to Moreton Bay (*11th Jan*, 1858) with such portions of the equipment as had been prepared in Sydney.

On reaching Ipswich forty horses were purchased, and having despatched the stores to Mr. Royd's station, on the Dawson River, by drays, the party was collected at that place; but, owing to unforeseen delays in the transport of the stores, the equipment and organization of the expedition were not complete till the latter part of March.

The following list of the party, horses, stores, &c., will show the principal arrangements.

The party consisted of nine persons, viz. :—

A. C. Gregory, *Commander*; C. F. Gregory, *Assistant-Commander*; S. Burgoyne, *Assistant*; G. Phibbs, *Overseer*. *Stockmen, &c.*, R. Bowman, W. Selby, T. Dunn, W. Wedel, and D. Worrell.

The stock consisted of horses alone, comprising 31 pack and 9 saddle horses, completely equipped.

Provisions comprised the dried meat of 2 bullocks and 4 sheep, weighing, as butcher's meat, 16 cwt., but when dried and the bones removed, reduced to 300 lbs.; in addition to this, 500 lbs. bacon, 1600 lbs. flour, 100 lbs. rice, 350 lbs. sugar, 60 lbs. tea, 40 lbs. tobacco, and some minor articles.

The arms and ammunition were: 1 Minié rifle, 8 double-barrel guns, 9 revolver pistols, 25 lbs. gunpowder, 150 lbs. shot and balls, percussion caps, &c.

For the conveyance of water two leather water-bags were provided, each holding 5 gallons, besides which each of the party was furnished with a water-bag of India-rubber, holding 3 pints.

The tents were made of calico, each suited for the accommodation of two persons, and the several articles of camp equipage were of the lightest construction consistent with the service required.

The instruments employed were an 8-inch sextant, box-sextant, prismatic compasses, pocket compasses, double axis compass, aneroid barometers, thermometers, and artificial horizon, &c.

Including forty sets of horseshoes, farrier's and carpenter's tools, together with sundry material for repairs, &c., the total weight of the equipment was about 4600 lbs. exclusive of the saddles and harness, which gave an average load of 150 lbs. as the net load carried by each pack-horse.

24th March.—These arrangements being complete the expedition left "Juanda" and proceeded by the road to Mr. Carew's station at "Euroomba," from which (*27th March*), under the guidance of Mr. Bolton—whose local knowledge was of material service—we made our way through the dense scrubs and broken country to the west for about 30 miles, to the head of "Scott's Creek," a small tributary of the Dawson River.

29th March.—The general course was now W.N.W., through a country with rich grassy valleys and dense scrubs of "brigalow" acacia on the higher ground. Green grass was abundant at this time; but I fear that in seasons of drought few of the water-holes are permanent. The timber consists of iron-bark, box, and a few other species of eucalyptus; the brigalow acacia attaining the height of

30 feet. Soft brown sandstones of the coal measures are the prevailing rock, forming hills with table summits.

2nd April.—With some difficulty, owing to the dense scrubs, we crossed the basaltic ridge which divides the eastern waters flowing to the Dawson River from those trending to the west into the basin of the Maranoa River, a tributary of which, probably the Merivale River, was followed westward. The country became more sandy, timbered with iron-bark, cypress, &c. The whole was, however, well grassed, and suited for grazing, if not too heavily stocked.

5th April.—Reaching the Maranoa River in about latitude 25° 45', water was scarcely procurable in the sandy bed, and we had to dig wells to obtain a supply.

Warned by the fact that Messrs. H. Gregory and Hely had been unable to penetrate the country to the west from scarcity of water, even three months earlier in the season, we followed up the Maranoa to "Mount Owen" (*7th April*), and having found a sufficient supply of water and grass for a few days' halt, I proceeded to reconnoitre the country to the west, and at length found a practicable route to the tributaries of the "Warrego" River, to which the party was advanced (*12th April*).

A heavy shower of rain had filled the gullies in this locality, and green grass clothed the country, forming a striking contrast to the dry and waterless valley of the Maranoa.

Fine openly timbered valleys, well suited for pasture, alternated with ridges of scrub of brigalow acacia till we reached "Mount Playfair" (*15th April*), a basaltic hill on the sandstone ridge which separates the Warrego Valley from that of the "Nive," a small branch of which was followed (*16th April*) down to its junction with the main channel in latitude 25° 6'.

The soil in the valley of the Nive is sandy, thinly grassed, and openly timbered with iron-bark, spotted gum, &c.; the back country rising into low sandstone ridges, covered with dense scrub of brigalow acacia. Some pools of permanent water, containing small fish, were passed, on the bank of which the remains of numerous native camps were seen.

17th April.—From the Nive River a N.N.W. course was pursued through a nearly level sandy country, covered with a scrub of acacia, eucalypti, bottle-tree, &c., which offered great impediments to our progress, till within 6 miles of the "Victoria River," when we suddenly emerged from the scrub on to open downs of rich clay soil; but the drought had been of such a long continuance that the whole of the vegetation had been destroyed and swept away by the wind, leaving the country to all appearance an absolute desert.

The bed of the Victoria was scarcely 10 yards wide, and perfectly dry, so that it was only after a prolonged search along its course that a small puddle of water was found in a hollow of the clay flat, and near it, fortunately for our horses, a little grass growing in widely scattered tufts.

Being now on the line of route which Leichhardt had stated his intention of following, the party was divided, so that both sides of the river were examined in all probable positions in which his camps might have been situated (*19th April*); but as the high floods appeared to have inundated the country for nearly a mile on each bank last year, all tracks of previous explorers were necessarily obliterated, and it was only by marked trees, or the bones of cattle, that we could hope to discover any trace.

During the first two days' journey down the river only a few small pools of water were seen, and these not of a permanent character, while the rich vegetation on the open downs, which had excited the admiration of Sir T. Mitchell on his discovery of the country in a favourable season, had wholly passed away, leaving little but a bare surface of clay, the deep fissures in its surface giving evidence of long-continued drought.

20th April.—In latitude 24° 37′, longitude 146° 13′, a small sandy creek, of equal size with the Victoria, joined from the east, and just below the first permanent pool of water was found. There was a slight improvement in the grass, but dense scrubs prevailed in the back country, and even approached the river at intervals.

21st April.—While collecting the horses near this pool of water, I detected a party of armed natives watching one of the stockmen, evidently, from their position in the scrub and general movements, inclined to hostilities, and I imagine that it was a knowledge that we were aware of their intentions which prevented my being able to establish any communication with them. I may here remark that this party, which numbered about eight, were the first natives seen during the journey.

21st April.—(Lat. 24° 35′, long. 146° 6′.) Continuing our route along the river we discovered a "Moreton Bay Ash" (*Eucalyptus sp.*), about two feet diameter, marked with the letter L on the east side, cut through the bark, about four feet from the ground, and near it the stumps of some small trees which had been cut with a sharp axe, also a deep notch cut in the side of a sloping tree, apparently to support the ridge-pole of a tent, or for some similar purpose; all indicating that a camp had been established here by Leichhardt's party. The tree was near the bank of a small reach of water, which is noted on Sir T. Mitchell's map: this, together with its actual and relative position as regards other features of the country, prove it not to have been either one of Sir T. Mitchell's or Mr. Kennedy's camps, as neither encamped within several miles of the spot, besides which, the letter could not have been marked by either of them to designate the number of the camp, as the former had long passed his 50th camp, and the latter had not reached that number on the outward route, and numbered his camps from the farthest point attained on his return journey.

Notwithstanding a careful search, no traces of stock could be found. This is, however, easily accounted for, as the country had been inundated last season, though the current had not been sufficiently strong to remove some emu bones and mussel-shells which lay round a native camping-place within a few yards of the spot.

No other indications having been found, we continued the search down the river, examining every likely spot for marked trees, but without success.

The general aspect of the country was extremely level, and even the few distant ridges which were visible had but small elevation above the plain, the highest apparently not exceeding 200 or 300 feet. Timber was wholly confined to the bank of the river, and though open plains existed, acacia scrubs were the principal feature.

Water became very scarce in the channels of the river, and we were principally dependent on small puddles of rain-water from a recent thunder-shower, but as we approached the northern bend some fine reaches of water were passed.

6th April.—In latitude 24° 2' we observed a small dry creek joining from the N.E. This I traced upwards for a few miles; but as its relative position with regard to the adjacent country, as well as the latitude, did not correspond with that of the Alice River on the chart, we continued our route; finding, however, that the general course of the river changed to S.W., I left the party at a small lagoon and rode up the river again (*28th April*), making a second search, more especially at the junction of the small dry creek, which proved to be identical with the Alice River, though more than five miles to the south, as the Victoria River never reaches the parallel of 24°.

Our position was now becoming very critical, as a long continuance of drought had not only dried up all the water, except in the deepest hollows in the channel of the main river, but the smaller vegetation, and even the trees on the back country were annihilated, rendering the country almost impracticable from the quantity of fallen dead branches, and even in the bed of the river, where the inundation derived from heavy rain near the sources of the river last year had somewhat refreshed the grass, it was scarcely possible to find subsistence for the horses. Under existing circumstances, it would have been certain destruction to attempt a north-west route from this point; and the only course that appeared open to us was to follow down the main river to the junction of the Thompson River, and ascend that watercourse so as to intersect Leichhardt's probable line of route, had he penetrated in that direction, favoured by a better season. At the same time it was probable that, like ourselves, he had been repulsed, and would then follow down the river, and search for a more favourable point from which to commence his north-west course, in order to round the desert interior on its northern side (*29th April*), and we therefore continued our search down towards the Thompson River.

The country was perfectly flat on both sides of the river, and showed traces of tremendous floods. The soil near the river was often deeply-cracked mud, water very scarce, and grass seldom seen. The back country was covered with scrubs of dead acacia, the soil a red sand or gravel; and such was the unpromising appearance that I began to fear our horses would soon fail for want of food and water; but having camped at a water-hole during Sunday (*2nd May*), to rest the party, heavy rain commenced, and though the greater portion of the water was absorbed by the dry soil, some of the channels of the river filled and commenced to flow. This relieved us from much difficulty as regarded the want of water, and enabled us to seek for grass in positions which were otherwise inaccessible.

3rd May.—Just as we were leaving our camp a party of seven natives made their appearance, but, though they came up to us, and talked much, I could get no useful information from them. As the party moved on they followed us, and, thinking they were not observed, made an attempt to throw a spear at one of the men; but Mr. C. Gregory wheeling his horse quickly and presenting a revolver at the intending aggressors, they ran away and left us to pursue our journey in peace.

The abundance of water was not without its inconveniences, and had the rain continued the party would have been annihilated, as our camp was between the deep channels which intersected the plain; and in attempting to extricate ourselves from the plains subject to inundation (*4th May*), found ourselves so completely entangled among the numerous deep channels and boggy gullies, in some of which the horses narrowly escaped suffocation in the soft mud, that after having forded one branch of the river, carrying the whole equipment across on our own backs, constructing a bridge over a second for the transport of the stores, and dragging the horses through as we best could with ropes, after three days of severe toil we had scarcely accomplished a direct distance of five miles (*6th May*).

The dry weather which followed rapidly hardened the surface of the clay plains, and I attempted to steer due west to the Thompson, but found the country so destitute of feed, and covered with dense acacia scrub, that we were compelled to return to the plains on the bank of the river.

8th May.—The valley of the river trending west was somewhat contracted, and did not exceed five or six miles in breadth; the plains were firmer, salt-bush and grass more abundant, and the horses recovered slightly from the effects of the barren country.

Keeping back from the right bank of the main channel, we passed some ridges of drift sand, and came on a fine lagoon nearly a mile in length. Here we surprised a party of natives, who decamped on our approach, leaving a net, fish, &c., which we of course left untouched, and camped at a spot lower down the lagoon.

9th May.—The next day, being Sunday, we remained at our camp, and the party of natives, consisting of seven or eight men, three or four women, and some children, approached us, and remained the greater part of the day near the tents. They were very anxious to enter the camp, but this was not permitted.

By signs they expressed that they had observed we had not taken away any of their property the evening before, when they ran away and left their nets, and were therefore satisfied our intentions were friendly; but we could not procure any information relative to the objects of our journey or the character of the country before us.

At 4 P.M. they informed us they were going to sleep at the most distant part of the lagoon, and would return next morning at sunrise, and then departed.

9th May.—After dark, however, the natives were detected attempting to crawl into the camp through the bushes, and though we called to them in an unmistakeable tone to retire, they would not withdraw.

As the position they had taken up was such as to command our camp, and render it unsafe in the event of an attack, it was necessary to dislodge them. I therefore fired a pistol over them, but was answered by a shout of derision, which no doubt would have been soon followed by a shower of spears had we not compelled them to retreat by a discharge of small shot directed into the scrub, after which we were not further molested.

10th May.—We were now approaching the junction of the Thompson River, but the country became worse as we advanced, and the last 5 miles of the plain were absolutely devoid of vegetation. Our hopes were, however, raised on finding that the late rain had caused the Thompson to flow, though the current was not strong; we had, besides, to travel upwards of 12 miles up its course before any grass could be found for the horses.

11th May.—Continuing our route up the Thompson, nothing could be more desolate than the aspect of the country: except the few trees which grew on the immediate bank of the river, there was scarcely a tree left alive, while the plains were quite bare of vegetation, except a few salsolaceous bushes. At the distance of 5 miles low ridges of red drift sand showed the desert character of all around; even the lower surfaces of the clouds assumed a lurid tinge from the reflection of the bare surface of red sand.

12th May.—In latitude 24° 40′ low sandstone hills, or rather table-land, approached both banks of the river, and the gullies which intersected them had supplied the water lower down, as the channel was dry above. We, however, succeeded in reaching latitude 23° 47′ (*15th May*), when the absence of water and grass—the rain not having extended so far north, and the channels of the river separating into small gullies and spreading on the wide plains—precluded our progressing farther to the north or west; and the only prospect of saving our horses was to return south as quickly as possible.

This was a more severe disappointment, as we had just reached the part of the country through which Leichhardt most probably travelled, if the season was sufficiently wet to render it practicable.

Thus compelled to abandon the principal object of the expedition, only two courses remained open—either to return to the head of the Victoria River and attempt a northern course by the valley of the "Belyando," or to follow down the river and ascertain whether it flowed into "Cooper Creek" or the Darling. The latter course appeared most desirable, as it was just possible that Leichhardt, under similar circumstances, had been driven to the S. W.

In order to ascertain whether any large watercourses came from the west, the return route was along the right bank of the Thompson, but only one small creek and some inconsiderable gullies joined on that side; nor was the country of a better character than on the left bank—consisting of barren plains, subject to inundation, low rocky ridges covered with dense scrub, and sandy ridges producing triodia.

22nd May.—We had nearly reached the Barcu, or Victoria River, when, in crossing a gully, Worrell's horse fell and hurt him so severely that we had to halt for some time before he could be placed on his horse again, and it was therefore fortunate that a small patch of dry grass was found on the bank of the river, which enabled us to halt the next day (*23rd May*), which was Sunday.

Travelling down the right bank of the river the principal channels were full of water, but the clay plains between were quite dry, the rain which had caused the river to flow not having extended so far south; nothing could well be more desolate than the unbounded level of these vast plains, which, destitute of vegetation, extended to the horizon. Our horses were reduced to feeding on the decayed weeds, and even these were so scarce that they eagerly devoured the thatch of some old native huts.

27th May.—We had nearly reached the farthest point attained by Mr. Kennedy when the horses showed signs of failing strength, and the channels on the east side of the plain being dry, I conceived it prudent to cross to the western side again.

The dry mud was so deeply cracked that the horses were continually falling, and one horse was so completely exhausted that we had to abandon him.

28th May.—Steering a westerly, and then a north course, we reached the small water-hole at Mr. Kennedy's second camp on the return route; there was just sufficient water to supply the party for one night, and a few scattered tufts of grass near it, but quite insufficient for the supply of so large a number of horses.

Close to the water-hole we found Mr. Kennedy's marked tree; it was a large box-tree, marked on the north side thus: $\boxed{\begin{matrix}\text{K}\\ 11\end{matrix}}$ The cuts of the axe and chisel were still quite clear, though twelve years had elapsed; but the slow growth and decay of trees in the interior may be attributed to the dryness of the climate.

29th May.—Steering north-west, after toiling nearly 30 miles across this fearful waste of dry mud, we at length reached a small patch of grass on a sandy hummock, but only just in time to save the horses, as many could scarcely keep on their legs, and we had to remove their loads to those which were less exhausted.

30th May.—Long before the next morning our hungry animals had consumed every blade of grass, and the small patch round the camp was reduced to the same barren appearance as the surrounding plain. We therefore started in search of food for them, and were fortunate in finding a second patch of grass, about 3 miles to the south, and halted for the remainder of the day, which was Sunday, thankful that Providence had enabled us to make it a day of rest.

31st May.—The running channel of the river being still to the west of our position we steered south-west, over barren clay plains, to some low ridges of drift sand, beyond which we found the channel full of water, with a slight current (lat. 26° 2'); but it terminated in a large reach of water which had not yet filled, and the channel lower down was dry.

Low ridges of red drift sand were now frequent on the plain, and appeared to be the higher points of the former sandy desert, the clay plains resulting from the deposition of mud in the hollows between which had in course of time filled it to one uniform level.

1st June.—The channels on the western side of the plain were very irregular, sometimes completely lost on the level surface, and again collecting into large hollows, with box trees on the banks, in which fine sheets of water still remained, some 100 yards wide and more than a mile in length. We therefore did not experience so much inconvenience with regard to the supply of this necessary element as from the absence of sufficient grass, and the all but impracticable nature of the mud plains.

4th June.—In latitude 27° low sandstone table-land approached the west side of the river, and we attempted to travel along the slope between it and the mud plains, but found it so stony that the horses' hoofs were soon worn to the quick, as we had been compelled to remove their shoes to enable them to traverse the mud plains.

Had it not been for green bushes of salsola, and some similar plants which had sprung up since the rain, this tract of country exactly resembled the stony desert described by Captain Sturt, as existing 200 miles to the westward. These remarkable features forming the declivities of the sandstone table-land through which "Cooper Creek" forces its way, and by confining the waters to a narrower space during floods, causes the fine deep reaches of water which characterise it.

8th June.—By following the western limits of the plains we reached latitude 27° 30', when the sandstone table-land receded, and a boundless expanse of mud plain was before us; the lines of box trees which had hitherto marked the channels nearly ceased, polygonum and atriplex constituting the main feature of the vegetation.

9th June.—After toiling S.W. a day and a half over this level surface to latitude 27° 50', we approached some low ridges, at the foot of which there was a lagoon 100 yards wide, exhibiting signs of a current during flood to the N.W.; and as there was an evident westerly trend in all the smaller channels previously crossed, it was evident they would soon merge in Cooper Creek.

Steering W.N.W. the several channels collected together, and soon formed a deep watercourse, with fine reaches of water.

9th June.—The sandstone table land closed in on both sides; the soil of the intervening plain was much firmer, but showed by the vegetation that saline nature which so often attends the development of the upper sandstones in Australia. Grass was abundant, and it was surprising with what rapidity the horses recovered their strength.

12th June.—Approaching the 141st meridian, which is the boundary of the province of South Australia, stony ridges closed in on both banks of Cooper Creek, forming almost a natural division, across which we followed a well-beaten native path; and here I observed the only instance which has come under my observation where the aborigines have taken the trouble to remove natural obstacles from their paths. The loose stones had been cleared from the track, and in some places piled in large heaps.

14th June.—After passing the stony ridge the valley became wider, the hills receding suddenly, in longitude 140° 30′, both to the north and south; and the whole country to the west seemed to consist of a succession of low ridges of red sand and level plains of dry mud, subject to inundation.

Shortly before reaching the branch of Cooper Creek, named by Captain Sturt "Strzelecki" Creek, we observed the tracks of two horses, one apparently a carthorse and the other a well-bred animal; but as none of their tracks were within the last month, the rain had obliterated them to such an extent that they could not be traced up, as they had left the bank of the creek on the first fall of rain, as is the usual habit of horses whose wanderings are uncontrolled.

There can be little doubt that these horses belonged to Captain Sturt, who left one in an exhausted state near this locality, and also lost a second horse, whose tracks were followed many miles in the direction of this part of Cooper Creek.

"Strzelecki Creek," which separates nearly at a right angle from the main channel, appears to convey about one-third of the waters of Cooper Creek nearly south, and, as we afterwards ascertained, connects it with Lake Torrens. We, however, continued to follow the channels which trended west for 30 miles, but large branches continually broke off to the south and west, and at length (*16th June*) the whole was lost on the wide plains of dry mud between the sand ridges; and, as there was no prospect of either water or grass to the west, I steered south and south-east for 50 miles over a succession of ridges of red drift sand, 10 to 50 feet high, running parallel to each other, and in a nearly north and south direction. Between these ridges we occasionally found shallow puddles of rain-water, or rather mud, as it was so thick with clay as to be scarcely fluid. Fortunately, a great quantity of green weeds had grown up since the rain, and the horses improved in condition and did not require much water.

21st June.—In latitude 28° 24′ we again came on Strzelecki Creek, and then followed it nearly S.S.W. between sandy ridges to latitude 29° 25′, when it turned to the west and entered Lake Torrens. (*25th June.*) No permanent water was seen in the bed of the creek, though there are many deep hollows which, when once filled, retain water for several months, and this, combined with the existence of a fine reach of water in Cooper Creek immediately above the point where Strzelecki Creek branches off, renders it far the best line of route into the interior which has yet been discovered.

Passing between the eastern point of Lake Torrens and what has hitherto been considered the eastern arm, but now ascertained to be an independent lake, the space between (about half a mile) was level sandy ground, covered with salicornia, without any apparent connecting channel. The course was continued S.S.W. towards Mount Hopeless, at the northern extreme of the high ranges of South Australia, which had been visible across the level country at a distance of 60 miles.

26th June.—As we approached the range of hills tracks of cattle and horses were observed, and 8 miles beyond Mount Hopeless came to a cattle station which had been lately established by Mr. Baker.

As the nature of the country we had traversed was such as not to admit of any useful deviations from it if we returned to New South Wales by land, I deemed it advisable to proceed forthwith to Adelaide, and, disposing of the horses and equipment, return with the party by sea to Sydney.

31st July.—We therefore proceeded by easy stages towards Adelaide, experiencing the greatest hospitality at the stations on our route, while our reception in the city was of the most flattering nature.

His Excellency Sir Richard Macdonald kindly gave me the use of an extensive paddock for the horses, and provided quarters for the men during the period which necessarily elapsed before the sale of the equipment of the expedition was effected. I have also to express my acknowledgments of the kind assistance rendered by the Honourable the Commissioner of Crown Lands, to the Surveyor-General, and the Superintendent of Telegraphs for valuable data connected with the construction of the map of the route, as well as to many other gentlemen whose cordial co-operation greatly facilitated my arrangements.

It is extremely gratifying to record my appreciation of the untiring zeal and energy which distinguished every individual composing the expedition; and it is to the unvarying and cheerful alacrity with which each and all performed their respective duties, that, under Providence, the rapidity and success of the journey are to be mainly attributed.

With reference to the probable fate of Leichhardt, it is evident, from the existence of the marked camp, nearly 80 miles beyond those seen by Mr. Hely, that the account given to that gentleman by the natives of the murder of the party was untrue; and I am inclined to think only a revival of the report current during Leichhardt's first journey to Port Essington. Nor is it probable that they were destroyed until they had left the Victoria, as, if killed by the natives, the scattered bones of the horses and cattle would have been observed during our search.

I am therefore of opinion that they left the river at the junction of the Alice, and, favoured by thunder showers, penetrated the level desert country to the north-west; in which case, on the cessation of the rain, the party would not only be deprived of a supply of water for the onward journey, but unable to retreat, as the shallow deposits of rain-water would evaporate in a few days, and it is not likely that they would commence a retrograde movement until the strength of the party had been severely taxed in the attempt to advance.

The character of the country traversed, from the out-stations on the Dawson River to the head of the Warrego River, was generally that of a grassy forest, with ridges of dense brigalow scrub. A great portion is available for pastoral purposes, but not well watered; and the soil being sandy, the grass would soon be destroyed if too heavily stocked.

As we advanced into the interior it became more barren, and, except along the banks of the larger watercourses, destitute of timber; and the character of the vegetation indicated excessive droughts.

North of lat. 26° dense scrubs of acacia prevailed on the level country beyond the influence of the inundations; but to the southward sandy and stony deserts, with low shrubby vegetation, were the characteristic feature.

West of longitude 147°, nearly to the boundary of South Australia, in 141°, the country is unfit for occupation, for, though in favourable seasons there might in some few localities be abundance of feed for stock, the uncertainty of rain and frequent recurrence of drought render it untenable, the grasses and herbage being principally annuals, which not only die, but are swept away by the hot summer winds, leaving the surface of the soil completely bare.

On Cooper Creek, near the boundary, there is a small tract of second-rate country, which, being abundantly supplied with water, may eventually be occupied. The best part is, however, within the Province of South Australia.

Between Cooper Creek and Lake Torrens about 120 miles of sandy country intervenes. This tract is destitute of surface water; but as it is probable that it could be obtained by sinking wells of moderate depth, I think it might be occupied to advantage during the cool season, and thus relieve the stations which are now established within Lake Torrens, though I fear that the summer heat would be too great to admit of permanent occupation.

The geological character of the country is remarkably uniform. Carboniferous sandstones and shales, containing occasional beds of coal, with superincumbent hills and ridges of basalt, extend from Darling Downs to the 146th meridian, where these rocks are covered by horizontal sandstones, with beds of chert and water-worn quartz pebbles. This latter formation extends as far as Mount Hopeless, where the slate ranges of South Australia rise abruptly from the plain.

The sandy deserts and mud plains are only superficial deposits, as the sandstones are often exposed where the upper formation is intersected by gullies.

The direction of the parallel ridges of drift sand appears to be the result of the prevailing winds, and not the action of water, it being sufficient to visit them on a windy day to be convinced that it is unnecessary to seek for a more remote and obscure cause than that which is in present operation.

It is, perhaps, with reference to the physical geography of Australia that the results of the expedition are most important; as, by connecting successively the explorations of Sir T. Mitchell, Mr. Kennedy, Captain Sturt, and Mr. Eyre, the waters of the tropical interior of the eastern portion of the continent are proved to flow towards Spencer Gulf, if not actually into it, the barometrical observations showing that Lake Torrens, the lowest part of the interior, is decidedly above the sea level.

Although only about one-third of the waters of Cooper Creek flow into Lake Torrens by the channel of Strzelecki Creek, there is strong evidence that the remaining channels, after spreading their waters on the vast plains which occupy the country between them and Sturt's Stony Desert, finally drain to the south, augmented probably by the waters of "Eyre Creek," the "Stony Desert," and perhaps some other watercourses of a similar character coming from the westward.

This peculiar structure of the interior renders it improbable that any considerable inland lakes should exist in connection with the known system of waters; for, as Lake Torrens is decidedly only an expanded continuation of Cooper Creek, and therefore the culminating point of this vast system of drainage, if there was sufficient average fall of rain in the interior to balance the effects of evaporation from the surface of an extensive sheet of water, the "Torrens Basin," instead of being occupied by salt marshes, in which the existence of anything beyond shallow lagoons of salt water is yet problematical, would be maintained as a permanent lake.

Therefore, if the waters flowing from so large a tract of country are insufficient to meet the evaporation from the surface of Lake Torrens, there is even less probability of the waters of the western interior forming an inland lake of any magnitude, even should there be so anomalous a feature as a depression of the surface in which it could be collected, especially as our knowledge of its limits indicates a much drier climate and less favourable conformation of surface than in the eastern division of the continent.

The undulations of the surface of the country are nearly parallel to the meridian, gradually decreasing in height from the dividing range between the eastern and western waters till, instead of the waters of the rivers being confined to valleys, they occupy plains formed by a slight flattening of the curvature of the sphere. Thus the sides of the plain through which the river ran before it turned west to Cooper Creek were 150 feet below the tangential level of the centre channels, and even the summit of the sandstone table land which rose beyond was below the visible horizon.

It is this peculiar conformation which causes the stream beds to spread so widely when following the course of the valleys from north to south, and it is only where they break through the intervening ridges that the water is confined sufficiently to form well-defined channels.

The existence of these extensive valleys trending north and south over so large a tract of country, renders it by no means unlikely that they continue far beyond the limits of present explorations, and it is not unreasonable to infer that the great depression which has been traced nearly 500 miles north from Spencer Gulf through Lake Torrens to the stony desert of Sturt (or rather the mud plains contiguous to its western limit), may be continuous for an equal distance beyond to the low land at the head of the Gulf of Carpentaria; a theory also supported by the fact, that the rivers flowing into the Gulf either come from the east or west, apparently from higher land in those directions, while there is not a single watercourse from the south, or any indication of elevated country in that direction.

With regard to the number and habits of the aborigines, I could gather little information, as only a collective number of about 100 men, a few women and children, were seen in small scattered parties; but, judging from the number of encampments seen, at least a thousand must visit the banks of the river; and it is probable that the whole of the inhabitants for at least a hundred miles on each side are dependent on it for water during the dry season.

Neither sex wear any clothing. Their weapons and utensils are similar to those used on the eastern coast; nor was there any characteristic by which they could be observed to differ from the aborigines of other portions of Australia.

Fish, rats, grass seeds, and a few roots, constitute their chief food.

On the upper part of the river they bury their dead, piling wood on the grave; near the junction of the Thompson they suspend the bodies in nets, and afterwards remove the bones; while on Cooper Creek the graves are mounds of earth 3 to 4 feet high, apparently without any excavation, and surmounted by a pile of dead wood. In the last-named locality the number of burial mounds which had been constructed about two years ago greatly exceeded the proportion of deaths which could have possibly occurred in any ordinary season of mortality, even assuming the densest population known in any other part of Australia; and it is not improbable that the seasons of drought which proved so destructive to the tree vegetation higher up the river may have been equally disastrous in its effects on the aboriginal inhabitants of this portion of the interior.

A. C. Gregory.

Sydney, 27th August, 1858.

The President.—I am happy to hear that the views of so experienced an Australian traveller as Mr. Gregory coincide with the opinion I have so frequently expressed as to the probable saline condition of the interior of Australia. This is the same gentleman who performed that remarkable journey from North Australia to Sydney, which obtained for him our Gold Medal. He is the first man who has gone far to determine the great problem, by journeys on three sides of Australia, that the great interior is a saline desert.

Count Strzelecki, F.R.G.S.—The valuable paper which was just communicated to the Society suggests at its outset a painful reminiscence, and as painful regret that Mr. Gregory's expedition, undertaken with a view to ascertain the fate of the deeply-lamented Leichhardt, has failed in the humane object with which it was conceived, and that, like the preceding ones, it only adds fresh evidences of the indubitable loss which the public has sustained. The services of Leichhardt deserved indeed all the efforts which New South Wales has been making in search of him. In about 1840, while I was engaged in surveying the south of that colony, Leichhardt began his career of an explorer in the north of Moreton Bay: in 1846 he undertook and accomplished the perilous journey across from Brisbane waters to Port Essington, which, from its dangers, privations, and value of geographical discoveries, earned for him the well-deserved honours which this Society and the colony so justly bestowed upon him. Unfortunately, in the end or the commencement of 1847, Leichhardt fell a prey to his praiseworthy attempt to traverse the continent from Moreton Bay to Swan River. His loss originated then a series of expeditions, among which that of Mr. Gregory deserves a most prominent place and notice from the range of scientific knowledge which it furnishes of the Australian continent. For although his expedition did not lead to the discovery of Leichhardt's traces, his different journeys from the north-east and south-east, performed towards the centre, girdle as it were the mysterious and impenetrable region of the interior of Australia, and facilitate thus the solution of that geographical problem. Considering then the services rendered to science by Mr. Gregory, this Society cannot but join cordially in the thanks to that distinguished explorer which are proposed to him from the chair.

The third Paper read was:—

3. *Exploration of the Murchison, Lyons, and Gascoyne Rivers in Western Australia.* By Mr. F. T. Gregory.

Communicated by the Colonial Office.

Perth, July 26, 1858.

Sir,—In accordance with the instructions conveyed in your letter of the 15th March, authorising me to take the command of the Expedition to Shark Bay, in course of organization by the northern settlers, I have the honour to furnish the following report of our proceedings while on that service, for the information of his Excellency the Governor.

The preliminary arrangements having been completed, and the heavy portion of the stores forwarded by sea to Champion Bay, I left Perth on the 26th of March, accompanied by Mr. James Roe as second in command, chainer Fairburn having started the previous day with the team and light equipment of the expedition.

Proceeding by way of Toodyay to the Irwin River, the party were joined by Mr. W. Moore, with three horses; passing on by way of Champion Bay, we arrived at Koobijawanna, the point of general rendezvous, by the 10th of April. On the 12th the remainder of the stores arrived from Champion Bay, the party being augmented to six persons by the addition of Mr. C. Nairne and Dugel, an aboriginal policeman. This day and the following were occupied in weighing and packing stores, shoeing horses, &c.

14th April.—The equipment of the expedition being completed (with the exception of one horse to be procured at the Geraldine Mine), we moved on to Yanganooka, passing the Geraldine Mine on the 16th, and bivouacked on the Murchison River, 6 miles above the mine, having obtained the additional horse, making in all six saddle and six pack-horses; our supplies consisting of 60 days' rations, on a scale of 1¼ lbs. of flour, 8 ozs. of pork, 4 ozs. of sugar, and ½ an oz. of tea per diem, the party being all well armed and furnished with ammunition.

The mean of our observations with the aneroid barometer gives 575 feet for the elevation of this part of the river above the sea.

17th to 25th April was occupied in ascending the Murchison River by easy stages to the junction of the Impey, the highest point attained by me last year. The only observations worthy of remark were, that the inundation had not been so great as that which occurred the previous summer, the grass up to this point not being by any means so abundant as I had found it on my former visit; the volume of water now running in the bed of the river being, however, at this time about the same, although none of the tributaries, including the Roderick and Impey, had been in flood, little or no rain having fallen to the W. of the 117th degree of longitude, except to the N. of latitude 26°.

I availed myself of the opportunity afforded to make several additions and corrections to the map of this part of the country, verifying the correction made by me last year in the latitude of Mount Murchison and adjacent hills. By an improved series of triangulation and a carefully observed set of lunar distances, I am inclined to place Mount Murchison in about longitude 116° 30′ E., which makes it more nearly approximate to the longitude formerly given by Mr. Austin.

The variation of the compass I found by several amplitudes to be 2° 30′ W. The bed of the Murchison River is here about 1077 feet above the sea. In addition to the fish and game formerly observed on this part of the river, we met with large flocks of the gallinule, which have for so many years excited the curiosity of the colonists as to their habitat; from subsequent observations it is evident they come from much farther to the north-eastward. But one party of natives had as yet been seen, consisting of eight or ten, who chased our native Dugel to the camp while out shooting, but it was difficult to ascertain whether with hostile intentions. From this time to our return we regularly mounted sentry during the night, and no one was allowed to quit the party any distance alone, a precautionary measure, the necessity of which was fully borne out by the sequel.

26th April.—From our camp, which was situated about 8 miles west of Mount Murchison, we fairly commenced the exploration of unknown country. Following the river nearly N.N.E. for 14 miles, it turned abruptly to the east; we, however, held our course, which, at 4 miles farther, brought us to the foot of Mount Narryer, which we ascended, and procured a valuable round of angles from its summit. This hill has an altitude of 1688 feet above the sea, and is formed by the eruption of a coarse dark-coloured crystalline trap through a base of amorphous sandstone, the direction of the range of which it forms a part being nearly north and south. Skirting round the north end of this range we struck east over a stony plain, thinly grassed, amongst open wattles, and at 5 miles again came upon the Murchison some time after dark. The pools here were somewhat larger than for many miles below, being from 60 to 80 yards wide and ½ a mile in length, the water in them becoming decidedly brackish; samphire, atriplex, and other salsuginous plants being abundant on the banks.

27th April.—We only advanced 9 miles, owing to Mr. Moore and Dugel having to return for one of the water-breakers, which had been torn off the pack-saddle the previous night in a thicket. Towards our bivouac, which was in latitude 26° 23′ 38″, the country near the river improved much, the channel of the river becoming very shallow; the water had spread over the flats for more than ½ a mile on either side, large flooded gum trees growing abundantly, with a fine sward of grass beneath, the soil being a rich brown clay loam. Gallinule and cockatoos were in large flocks feeding on the grass seeds, which were now nearly ripe.

28th April.—To latitude 28° 07′ the river continued to come from north by east through an extensive plain, bounded on the west by a low range of trap and granite hills, at an average distance of 6 or 7 miles, while to the eastward only a few distant peaks were visible, flooded gum growing plentifully for more than a mile back from the river, on flats of tolerably good pasture. Receding somewhat farther from the river the country opens out into extensive plains, yielding but little grass; atriplex bush and thinly scattered stunted acacia and melaleuca trees forming almost the entire vegetation.

29th April.—A few miles nearly north brought us to where a considerable tributary joins the Murchison from the north, the river trending first north-east, then east, and finally, towards the afternoon, it came from the southward of east, our bivouac being only 7 miles north of the previous night, while we had made nearly 18 miles of easting. The bed of the river had gradually become more rocky as we ascended; gneiss, with quartz dykes, passing through it and yielding a large quantity of salt, rendered the running water of the river scarcely drinkable: the only fresh water was found in the back channels filled by the late inundations. The ranges which ran parallel with the river to the westward terminated some miles to the north of the bend. Another range apparently granitic and broken up into detached peaks, commencing a little to the eastward of its termination, runs east for about 20 miles at the distance of 6 or 7 miles from the north bank of the river.

To the eastward an elevated range, with two conspicuous summits which were respectively named Mount Matthew and Mount Hale, terminated the view in that direction, while to the south only a few detached peaks were visible.

To-day we first observed a very beautiful convolvulus, which we afterwards found to bear roots like a sweet potato, some of them more than a pound weight and well flavoured, forming a very important article of food to the natives. The flowers are numerous, and measure from 2 to 3 inches in diameter, their outer edges of a dark lilac, deepening to a rich purple at the centre, with a pale-green convolute ribbing on the outside, the stem and leaf of the plant resembling the canidia. Mr. Drummond, to whom I have described it, considers it an important discovery, as by cultivation it might become a valuable addition to our Australian esculents.

A small species of rock-melon was also found in great abundance, about the size of a pigeon's egg, somewhat bitter to the taste, but they were not ripe; in other respects it much resembles the cultivated varieties.

The bed of the river at this night's bivouac had attained an elevation of 1240 feet above the sea.

30th April.—Finding that the Murchison was leading us too much to the eastward, the object of the expedition being to reach the Gascoyne with as little delay as possible, we quitted the river on a N.N.E. course for about 8 miles over a tolerably grassy plain, in some parts open, with atriplex and samphire, and in others rather thickly studded with acacia and melaleuca. Ascending a granite hill of 150 feet elevation, the plain was observed to the eastward to extend to the horizon, only broken by one remarkable bold trap hill at the distance of 20 miles, which was eventually named Mount Gould, the main Murchison flowing round its southern base, while a considerable tributary from the north-east passed close under it to the north-west. To the north of our position the country rose into a succession of stony ridges thinly grassed and nearly destitute of trees; in the valleys the kangaroo grass was tolerably plentiful and quite green, a sufficient evidence that we had now arrived within the influence of the rains that had produced the recent inundation, which gave us every hope of being able to push across the country intervening between this and the Gascoyne. We accordingly altered our course to north-west for the remainder of this and the following day, crossing several tributaries to the Murchison, in which we found plenty of water, and on their banks an abundant supply of grass for our horses; the streams being generally divided from each other by low stony ridges or plains of red sandy loam, yielding a rather scanty supply of grass.

3rd May.—Having rested the party the previous day, it being Sunday, in latitude 25° 33′ 48″, at a fine pool of fresh water in a stream running south, and apparently tributary to the Murchison, we resumed our course for 3 or 4 miles up a branch of the stream upon which we had been encamped, which terminated at a gentle stony ascent; another mile brought us to its summit, which proved to be the water-line between the Gascoyne and Murchison; its elevation was found to be 1500 feet above the sea. From this ridge a short descent northward led us to the head of a water-course, which we followed in the same direction for 17 miles, augmented by several small tributaries; turning to the westward it formed a junction with another river coming from the eastward, in latitude 25° 14′ 23″, at an elevation of 1144 feet above the sea.

The country through which we had passed was a nearly level and barren plain, evenly and closely paved with small stones, among which a few stunted acacia found a precarious existence; to this portion of country we gave the characteristic name of MacAdam Plains.

4th May.—The river we had encamped upon the preceding night had a level sandy channel 35 yards wide, with several shallow pools in its bed; a narrow belt of flooded gum lined either bank, which also produced abundance of excellent feed; several of the grasses were new to us, yielding a large quantity of seed; farther back the pasture was more scanty, and of an inferior variety of grass, the trees consisting almost entirely of small hakea or acacia.

The features of the country are generally very tame, with the exception of a prominent hill of considerable altitude nearly 20 miles to the northward, to which we gave the name of Mount Gascoyne. The summit of another range of less elevation, a little to the northward of west, distant 15 miles, was called Mount Puckford.

Having decided upon following the left bank of the river, with the view of ascertaining what tributaries might join it from the southward, we, this morning, took our course for Mount Puckford, touching frequently upon the bends of the river, which soon formed a junction with a large channel coming from the eastward, which ultimately proved to be the main Gascoyne; it was still running in a small stream in the bottom of a sandy bed 80 yards wide, traces of recent heavy floods being plentiful. At 10 miles the river has broken through a ridge of ancient opaque white lava, lying north-east and south-west, and a few miles farther, coming in contact with the south-east foot of Mount Puckford, it doubles back round its north-east base, and there takes a general north-west course to latitude 24° 36' and longitude 116° E., which we reached by noon of the 7th, a considerable tributary joining at this point from the northward. A compact sandstone range resting on a granite base (which was named the Lockier Range, after Mr. Lockier Burges, one of the principal promoters of the expedition) here diverts the course of the river to the left, which, by sundown, we found was running nearly south. The country, for the last 50 miles, varies but little in character; extensive open plains alternating with low granite ridges, the banks of the river, which here has acquired a width of 100 yards, with a depth of 40 feet, being, in many places, stony and cut down by deep muddy creeks, rendering travelling both slow and laborious. Several tributaries join from the north and south, all of which had very recently ceased to run.

To the north and east were several prominent peaks and ranges of trap hills clothed with short herbage; to the highest of the former, a single conical peak, with deeply serrated sides, was given the name of Mount James, after my friend and fellow traveller Mr. James Roe; while two lofty summits, far to the northward, were called Mount Samuel and Mount Phillips.

The principal feed was found near the banks of the rivers, the back country still yielding only a scanty supply of a red coloured silky grass of little value except when quite fresh. A tree resembling the sycamore of the Murchison, but with the leaves arranged in triplets, and the seed-pods in the form of a large bean, grows near the river, and attains a diameter of 2 feet, with a height of 40 feet; the wood is light and spongy, something resembling the Nuytsia floribunda, but not gummy. It is formed by the natives into shields, and near the coast into canoes. We also found on some of the rocky hills a tree with fruit and flowers, resembling a small fig, the leaves like a lemon, but yielding an acrid milky juice.

Several new species of crested quail and dark brown pigeons were first observed here; the beautiful small doves, common in the northern districts, were also seen by thousands; Gallinule and the elegant Geophaps plumifera (crested pigeon of the marshes) were also very numerous.

8th May.—Pursuing our course down the left bank, we crossed several stream beds which drain a large tract of country between this and the Murchison. The Gascoyne here divides into several broad sandy channels, sometimes as much as a mile apart. Towards evening we came upon a native encampment: few of the men appeared to have returned from their day's hunting, but we observed upwards of 30 women and children, who ran into the bed of the river to hide, some of the women immersing their children completely under water occasionally to prevent their cry of alarm attracting our attention. Although we had before met with and spoken to several natives, this was the first opportunity we had of examining into their domestic economy. Around their fires, of which there were many, were ranged a number of wooden scoops capable of holding from 2 to 4 quarts; these contained a variety of seeds and roots; the most plentiful was a species of grain like small plump drake gathered from a grass much resembling wheat, which is very abundant on the alluvial flats, and a root resembling an onion, not larger than a pistol bullet, a few rats, which are very numerous in the grassy flats, and a small variety of samphire like a Hottentot fig, formed the principal portion of their evening repast.

The few weapons left by the men consisted of heavy spears, with from 3 to 18 barbs cut out of the solid wood, the shaft from 10 to 12 feet in length; large shields resembling those in use by the natives at Champion Bay, made from the sycamore, and a few skins of the red kangaroo, formed their entire camp equipment.

Leaving everything as we found it, we passed on about 2 miles and encamped for the night on a low sandy island in the bed of the river, which was here full of flooded gums of large growth, there being just sufficient grass for our horses immediately around our fire. By 9 o'clock our supper had been disposed of, and I had just completed my observations for latitude, when we heard the shouts of a large party of natives approaching from the direction of their camp; leaving Mr. Roe with two others to guard the camp, I advanced with Mr. Moore and Dugel to ascertain the object of their visit, which we soon found to be evidently hostile, as they came on rapidly all well armed to the number of 60 or 70, the women and children retiring to some rocky ground, while the men advanced lighting the large stacks of drift which were abundant in this part of the river. When within about 40 yards they halted a moment, as we had damped our fire, and they could not exactly make out our position. Mr. Moore was in the act of removing his horse from the front when a fresh fire enabled them to see us, upon which ten or twelve of the leading men shipped their spears. Being still desirous if possible of avoiding a collision I hesitated to fire upon them, but observing a large body of them advancing with the evident intention of attacking Mr. Roe and his little party in charge of the camp, I advanced a few steps and fired a charge of small shot at the leading men as they were in the act of throwing at us: the effect was instantaneous and most salutary, as they fled with some precipitation, some of them being evidently wounded; we mounted extra guard for the remainder of the night, but they did not again venture to attack us.

9th May.—Being Sunday we only moved a few miles lower down the river for more grass, and again found ourselves in close proximity to the natives; in the course of the day several of them made their appearance at the top of a hill overlooking the camp, but appeared afraid to molest us; they had with them several large white dogs which were evidently of Australian breed.

10th May.—The river took a south-west course, receiving two large tributaries from the south-east, one of 90 and the other of 50 yards in width. The flats were wider and large trees more abundant; the recent floods had, however, been very destructive to the pasture, and removed much of the soil for a considerable distance back from the river. The trap hills here ceased to appear: the last remarkable one lay about 10 miles S.E. of our morning's camp, and had been named Mount Dalgetty. Our evening's bivouac was found to be in latitude 25° 14′, longitude 115° 30′ E. by account, and its elevation 700 feet above the sea.

11th May.—Until noon our course along the river was nearly north-west, sandstones beginning to crop out on the banks, and the country generally was poor and scrubby; from our noon halt to sunset, our course was nearly west; our bivouac being in latitude 25° 02′. The bed of the river had here widened out to 300 yards with an average depth of 30 feet, a small stream running through the sand in the bottom. In addition to the flooded gum, which grows here abundantly, observed in the bed of the river a melaleuca of large size like a paper bark-tree, but having broad leaves resembling the eucalyptus. During the night the natives were very noisy in the vicinity, some of them approaching so close as to startle our horses, keeping us well on the alert; the horses on this, as on several other occasions, appear to have been our principal safeguard against sudden attack.

12th May.—By the time we had commenced loading our horses a large body of natives had collected and approached to reconnoitre our camp; I advanced towards them to keep them in check until the loads were completed. On observing that I came alone, three natives advanced to meet me, throwing three or four spears at me in a friendly way, which I picked up and stuck in the ground by my side; this token at once established a good understanding, and after an interchange of presents they followed us for many miles down the river before quitting us. Towards nightfall several of our friends of the morning again made their appearance with a number of strange natives, dodging us among the deep muddy ravines, which abound at this part of the river; their manœuvres being equivocal and unsatisfactory we kept well on our guard; they, however, ran off at night, on my facing about on horseback to drive them away.

Our course during the day had been nearly west 22 miles, one large tributary having joined the river from the northward, which was afterwards named the Lyons, in honour of the gallant Admiral of that name; this accession had increased the breadth of the channel to 400 yards. As we drew towards our evening's bivouac, the river entered a gorge formed by the river cutting through the south end of a flat-topped sandstone range of about 1200 feet elevation above the sea, presenting many bold and picturesque outlines and detached summits, terminating in abrupt and almost precipitous faces; to this we gave the name of the Kennedy Range in honour of our present Governor.

To the south, a detached mass of broken sandstone hills gradually falls away in the distance, apparently into a barren scrub similar to those on the banks of the lower Murchison, while to the west lay before us an extensive plain, unbroken by a single object, save a few low ridges of red drift sand, clothed with a stunted scrub of melaleuca and acacia. The bottom of the gorge we found to be 480 feet above the sea.

13th May.—From this morning to noon of the 15th the country passed over was similar to that first described, the sand ridges running north-west and south-east at about a quarter of a mile apart; the river keeping a general course of west-north-west, its channel deepening to 60 feet, and maintaining an average width of 400 yards. Grass was only to be found in small patches along the margin of the river; the accumulated waters of the late inundations, having been confined to one channel, had risen to the height of 48 feet, carrying away many of the largest timber trees, as also much of the soil from the banks, leaving a scene of devastation exceeding anything of the kind I had hitherto witnessed.

A small description of Spanish reed was here first observed to grow on the margin of the pools. Deep muddy creeks, having only short courses, were very numerous, rendering travelling both tedious and intricate.

From noon of the 15th the country gradually opened out to a thinly grassed plain of light alluvial soil, atriplex bushes and acacia, widely scattered, forming almost the entire vegetation; the ground, with the exception of the bed of the river, being parched and dry, no rain having fallen during the summer to the west of the Lyons River in longitude 115° 30′ E.

16th May.—Being Sunday, we only moved 4 miles lower down the river for better feed, the channel widening out to 600 yards.

17th May.—Early to-day the river began to throw off numerous channels to the north and south, shedding, when in flood, a considerable amount of water over the adjoining plains, clothing the country in the garb of spring, the grass growing luxuriantly along the numerous channels, atriplex and other low bushes generally covering the plain, the lowest levels of which were extensively covered with fields of mud from 1 to 14 inches thick, the deposit of a single inundation, yet scarcely hardened by the summer sun.

At 20 miles we ascended a sandy ridge of about 60 feet in height, from which we had our first view of Shark Bay, Babbage Island, and the mouths of the Gascoyne, now only 4 miles distant.

Behind the ridge upon which we stood, and for many miles to the south-east, the country was still under water from the recent floods, while between us and the sea lay a low flat, on which were many patches of acacia thicket, alternating with open grassy glades, or fields of atriplex and samphire, terminating to the westward in a broad, irregular belt of mangroves, resting on the shallow margin of the bay.

Descending to the flat, we encamped in a rank patch of grass on the bank of the river, about a mile above Babbage Island, the north end of which I found to be in latitude 24° 52′, which is 4 miles north of the position as given by Sir G. Grey.

18th May.—We found no difficulty in crossing the southern mouth on to Babbage Island, the tide being low; it was quite dry at the junction. Having, with Mr. Roe, walked over the greater part of the island, making a rough sketch of its outlines, and completing the requisite observations, while the rest of the party were occupied in an unsuccessful attempt to catch fish, we retraced our steps and crossed the main channel opposite our last night's bivouac, where it is not more than 250 yards wide. Continuing our course north-east for nearly a mile, we crossed several back channels, some trending towards the Kolaina Flat of Sir G. Grey, while others were lost in the deep sandy ravines that extend for some distance to the north of the river.

While on Babbage Island several natives had waded across the northern mouth of the river to meet us, and had returned after a friendly interview, in which they apparently described the recent landing of two boats with Europeans. We now again fell in with the same natives on the north bank, near a large encampment of women and children: the latter quickly hid themselves on our approach, but the men assumed a threatening attitude, following us for some distance with much clamour. As their numbers quickly augmented, and they appeared determined to commence a fight, we led them out on to an open plain, where, leaving the pack horses in charge of two of the party, four of us suddenly faced about and charged them at a gallop. This harmless manœuvre had the desired effect; several of them having narrowly escaped being trodden under foot by the horses, they were very quickly dispersed, and made no farther attempt to molest us. We encamped this night about 6 miles above Babbage Island.

19th May.—As our object was to explore as far to the northward as circumstances would allow, we left the river on a north-east course, but two hours' ride across an open plain, through which several channels ran to the north-west, brought us to dry barren scrubs, in which it appeared hopeless that we should find either feed or water; we accordingly altered our course to south-east, and made the river again about sundown.

20th to 23rd May was occupied in tracing up the north bank of the river in the hope of finding a tributary coming in from the northward, but, with the exception of one small stream which drains the western face of the Kennedy range, not a single tributary was met with until we arrived at the Lyons River, a distance of more than 90 miles from Babbage Island. The country on the north bank differs but little from that on the south, except that travelling was somewhat easier.

24th May.—Our horses having had a rest, the previous day being Sunday, we made an early start, and by noon halted on the Lyons River a short distance above its confluence with the Gascoyne; its channel here was equal in magnitude and similar in appearance to the main river: a small stream was still flowing through the wide sandy bed, and gradually increased in volume for nearly 80 miles up the river. Three miles to the north of our midday halt Mr. Roe and myself ascended a steep sandstone peak, from which we had a fine view of the Kennedy range, the nearest part of which lay about 6 miles to the west, extending for nearly 30 miles to the northward; the eastern face presents an almost unbroken line of nearly perpendicular sandstone, of probably 500 or 600 feet elevation. To the north a few remarkable peaks served as valuable points to carry on our triangulation, which had been continued almost uninterruptedly from Mount Hope, on the Murchison.

To the east were several ranges of flat-topped hills, filling in the space between the Lyons and the great southern bend of the Gascoyne, while to the south, with the exception of a few very distant peaks, it appeared, as far as the eye could reach, to be an uniform plain of open but almost grassless scrub.

Having completed our round of angles, we struck south-east to a patch of forest on the banks of the river, which we did not reach until some time after dark.

25th May.—From this point to lat. 23° 56′, the Lyons maintains a general course of N.N.E. The country passed over during to-day had evidently been tolerably grassy, but the floods had been quite as destructive here as on the Gascoyne, the bed of the river and flats for half a mile on each side being mostly choked up or buried under fields of fine white sand, which had been brought down by the inundations. In several places we observed beds of gypsum and fossil shells, with other strong indications of the existence of coal in the vicinity. Bivouac in lat. 24° 41′ 18″.

26th May.—A few miles along the river brought us to a gorge in the eastern edge of the sandstones, to the east of which it opened out into extensive plains, in some parts well grassed and in others much washed by the river. Several trap and granite hills were visible at some distance to the northward and eastward. Our bivouac was in lat. 24° 31′ 05″, about 3 miles south of a bold trap range, the summit of which was named Mount Sandiman.

27th May.—The country still maintained its variable character, travelling near the river being exceedingly heavy on account of the sand. The morning had been calm and sultry, but towards noon a strong breeze set in from the north, bringing with it a dense cloud of fine red dust, against which it was no easy matter to make head with our horses. Towards evening the flats begun to improve, and we halted for the night among fine grass; melons and tobacco also growing very luxuriantly. To-night it rained for about two hours, clearing the atmosphere of its load of dust.

28th May.—Resuming our course up the river, at 4 miles we crossed a stream-bed 40 yards wide, coming in from the N.N.W., and in the course of the day passed over several thin beds of opaque white lava resting upon the sandstone. At our camp, which was in lat. 24° 3′ 08″, granite began to make its appearance in the bed of the river.

29th May.—Our packhorses having now been much lightened of their loads, we were to-day, for the first time, able to trot for several hours, and as the country still improved, several fine grassy valleys coming in from the eastward, we made considerable progress.

At our noon halt, Mr. Moore and myself ascended a hill of red schist, of 300 or 400 feet elevation, in lat. 23° 57′ 15″, which had been named Mount Thomson. From this hill we had an extensive view of the surrounding country; close to the northern foot the river divided into two nearly equal parts; one, coming from the N.N.E., we named the Alma. To the north, just resting on the edge of the tropic, lay a compact range, through which there was apparently but one break, and that was on the line of the Alma; from the southern face of this range, which extends nearly 40 miles to the eastward, numerous streams take their rise and flow southward into the Lyons, which had altered its course and was now coming from the E.S.E. Our intention had been to keep our course until we had touched upon the tropic, but, as the Alma was not running, we decided upon following the main course of the stream, and accordingly adopted an easterly course for the remainder of the day, encamping about 6 miles to the east of Mount Thomson. The river here was much narrower, with a rocky bed containing many pools of permanent character, overshadowed by flooded gums of large growth, much resembling the *Eucalyptus piperita* of the flats of the Swan, but not possessing the same pungent leaf.

30th May.—Sunday. Found our latitude to be 23° 58′ 32″, and long. 116° E., by account.

31st May.—We started off at a quick pace, clearing 16 miles by noon, over some fine open grassy flats, timbered for nearly a mile from the river; one tributary 100 yards wide having joined from the north and a smaller one from the south. Leaving the party busily occupied catching fish, which were abundant in this part of the river and much resembling those found in the Murchison, but much larger, some of them being upwards of a pound in weight, I walked with Mr. Nairne to the summit of a granite hill 2 miles to the northward, from which I had a number of cross-bearings to hills already observed from Mount Thomson. One of considerable elevation, bearing N. 121° 30′ E., distance 50 miles, lay directly up the valley of the river, and was named Mount Augustus, after my brother, now conducting the expedition in quest of the remains of Dr. Leichhardt. Pushing on 12 miles farther, we halted for the night in lat. 23° 59′ 39″. Tobacco here grew of sufficient size for manufacture, occupying many hundred acres of the best land: a plant much resembling stramonium was also abundant on the moist land, yielding a strongly offensive odour from its leaves.

1st June.—For the first 12 miles along the river the flats much improved, and were only occasionally broken up by stony ridges; good country was seen to extend up the tributaries, several of which came in from the north. To the south, at 2 or 3 miles distant, and running parallel with the river for many miles, was an even grassy range of moderate elevation, nearly destitute of trees or bushes: the acacia and melaleuca, which had hitherto generally covered the plains, were evidently fast giving way to an open, undulating, and thinly-grassed country, the back lands being, however, still too stony to yield much pasture, the summer grass being already parched and dry, the flats alone continuing moist and verdant.

At our noon halt the main river had ceased to flow, but a tributary coming from the N.E. had a small stream still running in the bottom of a muddy channel, down which the recent floods had brought flags and portions of bulrush, the only instance throughout the district in which we had observed them.

The next 10 miles passed over between this and sunset was chiefly an alluvial flat, much resembling the fertile lands near the mouth of the Greenough: the acacias and several varieties of melaleuca, among which was the *Callistemon phœniceus*, with its beautiful scarlet flowers, were growing with tropical luxuriance, the soil in many places being still saturated with moisture. A water melon was here first observed, the fruit not attaining to more than two inches in length, but not otherwise differing from the cultivated kinds. We also found a fruit in shape like a pear, three inches in length, growing on a small creeper; the interior of the fruit consisted of a number of small flat seeds, to which were attached a bundle of long silky fibres resembling cotton. Our bivouac was in lat. 24° 7′ 52″, near a fine pool of fresh water, with limestone cropping out in a thin bed on the banks; we had frequently met with it distributed in small nodules scattered over a large portion of the country on the Upper Murchison.

Since quitting the mouth of the Gascoyne we had seen natives almost daily; to-night we again found ourselves in close proximity to a large encampment of them.

2nd June.—Our neighbours paid us an early visit this morning, some of them evidently bent on mischief, but were restrained by others more prudent, not, however, before it had nearly cost one of them his life; having pointed a spear at Mr. Moore, Dugel, whose natural instincts are very destructive, hastily took aim at him, but fortunately pulled the wrong trigger, which just gave his adversary time to lower his weapon. On our mounting our horses they hastily fell back and joined their other companions at their camp, which was just in our line of march; about thirty of them awaited our approach with some tokens of defiance, but most of them decamped on our coming within spear's throw.

Directing our course for Mount Augustus, we pushed on at a rapid pace, with the object of ascending it, if possible, before sundown, but, after riding 20 miles, we found it to be farther off than we anticipated, and accordingly altered our course and encamped at a pool in the river about 3 miles N.E. of the Mount, in lat. 24° 20′, and at an elevation of 1500 feet above the sea.

We here met with strong evidences of the cannibalism of the natives; at a recently occupied encampment we found several of the bones of a full-grown native that had been cooked, the teeth marks on the edges of a blade-bone bearing conclusive evidence as to the purpose to which it had been applied; some of the ribs were lying by the huts with a portion of the meat still on them.

Nearly the whole of the country passed over this day was an alluvial flat, extending on the south-west to the grassy range already described, while to the north and east it extended for many miles, branching out into the numerous valleys that drain the different ranges in that direction; the grass and vegetation on these flats are not so rank as on that traversed the previous day, but more even, and the soil better adapted for agriculture; the amount of good land on this part of the Lyons River was estimated at 150 square miles, while on the tributaries between Mount Thomson and Mount Augustus I have no doubt that there is as much more. Water at this time was plentiful in the numerous channels that intersect the plain, their permanency being the only matter of doubt: our limited acquaintance with the nature of the seasons in these latitudes does not enable us to decide with any degree of certainty; the pools lower down the river are unquestionably of a permanent character, but many of them were already becoming brackish.

The quantity of game seen in this part of the country was also a favourable indication. Turkeys, and a new variety of pigeon having a brown back and slate-coloured breast, on the wing resembling a tame pigeon, congregate in flights sometimes of a thousand together; emou, cockatoos, quail, and paroquets are also very numerous, particularly the latter.

3rd June.—A gentle ascent of 2½ miles brought us to the foot of Mount Augustus, where, leaving our horses in charge of Fairburn and Dugel, we commenced the ascent up the only accessible point on this side of the hill; it required two hours' heavy toil to bring us to the summit, the barometer gradually falling until it only registered 26·10, which, compared with the simultaneous observations kept at Champion Bay by Mr. H. Gray, gives an elevation of 3,480 feet above the level of the sea, the last 500 feet of the summit being clothed in thickets of melaleuca, among which grew a nondescript variety of red gum-tree, the only new thing observed in this locality. The air was fortunately very clear, enabling us to take bearings to almost every remarkable summit within 80 miles, and in two instances to hills more than 100 miles distant.

From this commanding position I was enabled to sketch in the courses of the rivers for more than 20 miles, some of them probably taking their rise from 60 to 100 miles still farther to the eastward. To the N.E. the country continued to improve in appearance until the view was intercepted by bold ranges of trap and granite, one of which, bearing N. 30° E. magnetic, distant nearly 100 miles, having a sharp volcanic outline, reared its summit above all the rest. To the S.E. the country was not quite so promising, the ridges presenting naked stony outlines, upon which was only a little scanty grass or a few bushes; to the south it was almost an uninterrupted plain, extending almost as far as the Murchison River, over which lay our homeward course. Descending the Mount, we encamped at a spring, in some fine feed, close at its foot.

4th June.—As we had now been out fifty-one days, and as our provisions were only calculated to last twenty-four days longer, although we had reduced our allowance shortly after quitting the Geraldine Mine, we were reluctantly compelled to turn our steps homeward, as we were still 360 miles from the settled districts. Passing, therefore, over the eastern foot of Mount Augustus, we pursued a S.S.E. course for 20 miles, over alternating grassy plains and stony ridges; we encamped on a river with a sandy bed, in which were a few shallow pools, its trend bearing N.N.W., and probably joins the Gascoyne near the Lockier Range. The feed on this river, as well as on those between this and the Murchison, was principally kangaroo grass of strong growth; the course of the stream being easily traceable from a distance by the flooded gum-trees that invariably lined their margins.

5th June.—A south course of 10 miles over a poor stony country brought us to the head of a stream, which following in the same direction to lat. 24° 51′ 52″, we found plenty of grass on its banks and pools of water in its bed, which was here 30 yards wide; the principal features of the adjacent country being low granite ridges, intersected by occasional quartz dykes, alternating with chlorite schist.

6th June.—Sunday.

7th June.—Following a S.S.E. course, at 6 miles the stream turned to the S.W. Passing over several miles of stony country, in lat. 24° 59′ 32″, we crossed another stream-bed, 40 yards wide, running to the westward, and forming a junction with the last at some miles distant. Towards sundown we came upon a recently inundated plain, and a mile farther struck a grassy channel 30 yards wide, which had barely ceased running, the soil for some distance on either bank being a strong red loam, yielding a fair supply of pasture. This channel we afterwards found to be only one of several which formed the main branch of the Gascoyne. The observed latitude was 25° 6′ 30″, and elevation 1740 feet above the sea.

8th June.—A mile farther we came upon the main channel of the river, with a wide shallow bed, down which a small stream was still running: the flats were well grassed, and the flooded gums growing for more than a mile back from the river. To the eastward the country continued level and grassy as far as the eye could reach; our time was, however, too limited to admit of our making any further examination of this promising tract. A party of 20 or 30 natives were encamped here, and were apparently living upon the roots of the convolvulus, which grows in the vicinity in great abundance.

For 15 miles to the south-east it continued a level plain of red loam, tolerably well grassed and covered with an open wood of acacia; the next 8 miles was over a poor, stony ridge of moderate elevation, terminating at a large dry stream bed, in latitude 25° 24′ 16″, with some fine kangaroo grass on its banks.

9th June.—Ten miles south, over a granite country, we struck the head of a water-course, which, after winding about for 16 miles, ran close to the western foot of Mount Gould, where we encamped at its junction with another small stream coming from the northward. The country passed over to-day was generally very stony, until we came within a few miles of Mount Gould.

10th June.—Taking our course direct for Mount Hale, the pasture rapidly improved; at 10 miles the water-course we had been following formed a junction with the main Murchison coming in from the eastward. From the appearance of the river at this point, it is probable that it takes its rise nearly another 100 miles farther to the N.E. The next 13 miles down the river was fair average cattle pasture, extending for several miles to the right and left—open flats of atriplex and samphire occurring at intervals.

11th June.—The river soon divided into several channels, shedding its waters over a fine alluvial flat of considerable extent, yielding a rich sward of grass, under flooded gums of large growth. A little after noon we came upon our outward track, and encamped at night near the north-west bend of the Murchison.

12th to 22nd June was occupied in descending the river to the Geraldine Mine, cutting off several bends of the river, and making such additions to our sketch of the outward route as circumstances would admit.

23rd June.—We all arrived safe at the hospitable residence of Mr. W. Burges, just in time to escape a set in of rain, which lasted, with little intermission, till the 26th.

27th and 28th June were employed in packing up and otherwise disposing of the equipment of the expedition. On the 29th we arrived at the house of Mr. L. Burges, on the Irwin; the following day being occupied in making up the accounts connected with the expedition, which, including the whole of the cash expenditure, did not exceed 40*l*., which sum had already been subscribed by a few settlers interested in the undertaking.

Quitting the Irwin on the 1st of July, and proceeding by way of Dandaragan and Toodyay, I arrived with Mr. Roe and chainer Fairburn in Perth on the 10th instant, having accomplished a journey of nearly 2000 miles in 107 days.

On reviewing the foregoing report, I find it necessary to add a few observations on subjects that could not well be introduced into the body of the narrative.

In the first place, viewing the geographical and geological features in combination, the tract of country contained within the 114th and 118th parallels of longitude, and the 24th and 27th degrees of south latitude, may be considered as an inclined plain, the eastern edge of which has an elevation of about 1700 feet above the level of the sea. Commencing from the coast, the first 100 miles is almost exclusively of tertiary sandstone formation, which the process of denudation has, in many instances, converted into either stony or sandy tracts, rarely fertile, except when subject to the influence of frequent inundation. This region seldom gives rise to rivers or watercourses; the flat-topped ranges which are often found towards the eastern limits of this formation do not generally exceed 500 or 600 feet in altitude, and are only those portions of country that have not as yet yielded to the waste of time or the constant action of rivers, which, rising in the higher lands more to the eastward, rapidly abrade, and in their onward course remove the soft and porous sandstone from their bases.

In the deeper valleys, towards the eastern edge of these sandstones, thin beds of oolitic limestone, containing numerous fossil shells, occasionally occur; also gypsum and clayey shales, with other indications of the probable existence of coal in the vicinity: following the series appears a compact, fine-grained amorphous sandstone, having an almost flinty fracture; this rock in a few miles gives place

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to granite and gneiss, frequently broken up by the upheaval of whinstone and porphyritic trap hills, having an elevation of from 100 to 500 feet above the plain.

As we proceeded eastward, the eruptive rocks became more numerous; chlorite slate, veins of quartz, chert, and variegated jasper, frequently forming the summits of the most elevated hills, while, on the general level of the plain, are occasionally found thin beds of ancient lava.

The rivers, unlike most others in Western Australia, have nearly an even fall throughout their entire length, amounting on an average to 6 feet per mile: this, in a country subject to the sudden fall of almost tropical rains, is what gives rise to the destructive inundations already described.

Of the climate and seasons, so little is at present known, that, allowing all other difficulties to have been overcome, it would be very hazardous to risk flocks and herds beyond the head of the Murchison, until the country has again been visited at a different period of the year, as it is probable that it has as yet only been seen under the most favourable conditions.

The fluctuations of the temperature are occasionally considerable: in the middle of June it some days amounted to 46° in six hours, registering at 7 A.M. 36°, and at 1 P.M. 82°; ice having been seen as far north as lat. 24° 30′.

The prevailing winds during the period of inundation appear to have been from the south-east, as most of the trees blown down while the soil was in a state of saturation, lay with their tops to the north-west. In May and June the winds ranged between north-east and south-east.

Of the regularity of the return of the summer rains it is at present difficult to form a decided opinion; but as far as observation would admit, I am inclined to think they cannot be relied on with any degree of certainty to the southward of the 25th degree of lat., the period at which they fall being about January and February; and it is a significant fact that the grass found buried beneath the mud during these months, had generally attained only about half its growth.

With regard to the quantity and distribution of the available lands, it will only be necessary to observe that, with the exception of 30,000 or 40,000 acres at the mouth of the Gascoyne, there is no land worth occupying for many years to come to the west of the Lyons River. The amount of land on this river has already been estimated at nearly 300 square miles, while on the Upper Gascoyne and its tributaries there is, probably, double that quantity: this, with the lands on the Murchison, near Mount Hale, would make a total of about a million of acres.

A very important circumstance in connection with this district is the total absence, so far as we were able to observe, of any of the varieties of Gastrolobium or Euphorbia, which constitute the poisonous plants so fatal to cattle and sheep in other parts of the colony.

The means of access to the Upper Gascoyne and Lyons is another important matter for consideration. I am inclined to think that these districts cannot be advantageously settled until the tract of country between it and the north coast has been explored, and a port established somewhere between Exmouth Gulf and Depuch Island, as, should the country in that direction fulfil its promise, the intervening space would very quickly be filled up and the lands on the Gascoyne become available, its distance from the north coast being about 200 miles, while from Port Gregory or Champion Bay would not be less than from 340 to 360 miles; a difference of some moment in the transport of stores or produce.

From the lay of the country to the northward of the Lyons River there does not appear to be any reason to suppose that a river of any magnitude falls into Exmouth Gulf, as there would be hardly room for it between the sources of the Alma and the rivers flowing to the north coast.

I cannot bring my Report to a conclusion without recording my acknowledgments to Mr. James Roe for the able and efficient assistance he has rendered me throughout the expedition, barometrical observations and management of the provision department having been especially under his charge.

My best thanks are also due to Mr. W. Moore and Mr. C. Nairne, who on every occasion endeavoured to relieve me as much as possible from some of the many arduous duties that necessarily devolve on the leader of an exploring party. Chainer Fairburn and the Native Dugel also gave general satisfaction in the performance of their respective duties.

I may add that to the ready co-operation and unanimity that prevailed throughout the party may, in no small degree, be ascribed the successful issue of the undertaking.

I have the honour to be, Sir, &c.,

F. T. Gregory, Assistant-Surveyor.

To the Hon. the Surveyor-General, &c.

The President.—I feel personally obliged to Mr. F. Gregory for having brought the Murchison River into fashion. When my friend Sir George Grey, the present governor of the Cape of Good Hope, went to explore this country many years ago, I was enabled to be of some little use to him, and in gratitude he named after me one of the rivers that he discovered. It was supposed that this river would turn out only a poor stream through a barren saline country; but I am glad to hear that it is so productive. Moreover, I find they have named two of its affluents, the "Roderick" and the "Impey." To pass from that part of the subject, I consider the paper one of great value. Western Australia is rapidly extending into importance. We have long wished to know whether a large and rich tract of country might not be colonised to the north. Mr. Gregory has assured us that such tracts do exist, and has also shown that there are copper-mines, iron, and other ore in great abundance. Mr. F. Gregory is one of the three younger brothers of our Medallist, and they are all good geographical explorers.

MR. J. G. AUSTIN.—I have been a resident in Western Australia from thirteen to fourteen years, and I have had a personal acquaintance with the family of Mr. Gregory, and can speak to their energy and competency, and to the credit which their statements deserve. Some three or four years ago the tribes who communicate one with another in a chain down to Swan River, gave us to understand that birds mentioned by Mr. Gregory came from a good country. Consequently an exploration was formed for the purpose of discovering whether it was so or not. The discovery by Mr. Gregory of this bird, which had not been seen on the Swan River, except in 1854, during the last twenty years, proves, in my opinion, that there is a great extent of good land in the neighbourhood in which it was found by Mr. Gregory. It is apprehended that the great distance at which the land is situated from head quarters will for a time prevent the colonists from taking advantage of it; and a report is current that to the east and north-east (at about 250 to 300 miles east of the Swan River) there is an impenetrable belt of underwood, which the natives say is forty miles through, and impossible to be penetrated, and which presents an insuperable barrier to further exploration of the interior of the great continent of Australia from the western coast.

MR. J. CRAWFURD, F.R.G.S.—I wish to say a few words upon those productions which are said to characterise the river Murchison—a very good name, and I wish the river were worthy of it—the wild tobacco, the musk-melon, and the water-melon. As to the wild tobacco, I believe that to be perfectly correct, and say so on the authority of my late excellent friend Robert Brown. But he assured me it was of no value as a production. The land watered by the Murchison is the first part of Australia in which I have heard of anything like an esculent tuber resembling that of the Convolvulus batata—the potato. Will any botanist present assure us that this is the true batata? because if it were so, or indeed any esculent tuber, the natives in this part of Australia ought, cultivating it and feeding on it, to have been found in a higher state of civilisation than any Australians have yet attained. With respect to the musk and water-melon, Mr. Gregory must have mistaken something else for them, because they are really the productions of certain parts of Asia. I am glad to hear of this fertile territory of the river Murchison. It will no doubt be quite favourable for the production of wool, and a very different country for the sheep from the hot tropical region of Australia to which some gentlemen have been proposing to push their runs.

PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

SESSION 1858–9.

Second Meeting, Monday, Nov. 22nd, 1858.

Sir RODERICK I. MURCHISON, President, in the Chair.

Presentations.—*The Right Hon. Sir John Pakington, Bart.*, M.P., *First Lord of the Admiralty; Edward Beldam; Joseph Locke*, M.P.; *and Alderman W. A. Rose, Esqrs.; were presented upon their election.*

Elections.—*Lord Ashburton; Sir Alexander Bannerman, Bart.; Viscount Cranbourne; Captain Chas. D. Cameron, H.M. Vice-Consul at Redout Kalé; Lord Skelmersdale; Captain Hammel J. Strutt; Captain the Hon. Sudeley C. G. H. Tracy; the Rev. Richard Leah*, B.A.; *and James Barratt; John Botterill; Francis W. Davis*, R.N.; *John Donne; Edward J. Hawker; David Kay; Joseph Mayer; James Pincott; H. Birch Reynardson; J. Northcote Ryder; and Theodosius Uzielli, Esqrs.; were elected Fellows.*

Exhibitions.—A Chart of the Delta of the Danube, by Captain Thos. A. B. Spratt, R.N.; Views of Norfolk, the Fiji and other Islands in the South Seas, by Captain Denham, of H.M.S. *Herald*; Chart of Shark Bay and Gascoyne River, N.W. Australia, by F. T. Gregory; and Brion's Relief Map of Brighton and its Environs; were exhibited to the Meeting.

The Papers read were—

1. *Notes, Geographical and Commercial, made during the Passage of H.M.S. Furious, in 1858, from Shanghai to the Gulf of Pechili and back.* By Capt. Sherard Osborn, R.N., C.B., F.R.G.S., &c. *With Sailing Directions* by Mr. S. Court, R.N.

Part I.

Thanks to the obstinacy of the Chinese Government, which rejected the advances made by the plenipotentiaries of Great Britain and France to bring about an amicable arrangement of existing differences by a conference at Shanghai in the spring of the present year, His Excellency Lord Elgin found himself compelled to proceed thence to Tientsin, on the Peiho River, with a naval force, so as to compel H. I. M. Hien-Fung the First, to listen to our demands.*

H. M. S. *Furious* had already had for some months the honour of carrying about the British ambassador and suite in Chinese waters; and replete with interest as had already been my cruise in the old steam-frigate, the new ground upon which we were shortly to enter rendered the voyage we were about to make a source of perfect delight, and all our preparations for a prolonged stay in the Gulf of Pecheli were expeditiously and zealously completed. Apart from mere curiosity, the importance of reaching the near vicinity of the Chinese capital, and of placing the ambassador in a position to dictate his own terms, had long been patent to all; and none but those grown blind by gazing at Canton could help seeing that it was unworthy of Great Britain to be merely squabbling with the militia of a wretched Chinese city, two thousand miles distant from the centre of government.

Taking care to start from Hongkong at such a time as to give the *Furious* the best chance of escaping the bad weather likely to occur about the vernal equinox, we were enabled to visit Swatow, Amoy, Fu-chow-fu, Ningpo, Shapu, and the whole Chusan Archipelago, without encountering a single double reef topsail breeze to mar the interest of the trip to my many guests, or prevent them by sea-sickness from acquiring that *local information from personal observation* of the resources and capabilities of the many places visited, which, after all, is worth far more than reading whole libraries of travel or history.

After waiting at Shanghai from March 25th to April 8th for the Admiral and gunboats to arrive, Lord Elgin induced Captain Sir Frederick Nicolson of the *Pique* to proceed to the Gulf of Pecheli without farther delay; and a few days afterwards, April 10, 1858, the *Furious* took the *Slaney* gunboat in tow, and weighed from Shanghai to proceed down the Yang-ze-kiang River for the same destination.

Of the queen of central China, the good city of Shanghai, I need not say more, while so much has been written and is being written of it, than that sixteen years ago I was one of some half-dozen English boats' crews, under the present Commodore Watson, who first burst upon the Chinese quietude of its existence as the pioneers of a new order of things; and I am sure not the most sanguine among us could have anticipated that such a magnificent European colony would have been created in so short a space of time—that where no foreign keel had ever before floated, an import and export trade in European bottoms, amounting to the value of (26,774,018*l.*) twenty-six millions seven hundred and seventy-four thousand odd pounds! would *now* exist,* and that at the same time the native trade and native craft would show no apparent diminution. Yet it is so. Where a low, unhealthy marsh existed, dotted with squalid Chinese abodes, a fine quay, or bund, is now seen; such a quay as would put you, who live on the banks of Father Thames, to the blush!—handsome houses, gardens, yachts, mail steamers, and steam-tugs—a thousand indications, in short, of the wealth and prosperity of the commercial community.

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* *See* 2nd Vol. of the "Proceedings" R. G. S., p. 201, for Mr. Wm. Lockhart's Notice on China.—Ed.

The naval officer, contemplating such a scene of prosperity and wealth, replete with high promise to all the world, suddenly created on the footprints left by his profession, may, at any rate, without egotism, say that its labours have not been in vain; and as I turned my back upon Shanghai towards the fresh unbroken ground north of the Yang-ze, the hope naturally arose that our labours might be equally prolific in benefits to Great Britain and China.

The weather, whilst we had been in Shanghai, was beautiful; the north-east monsoon had lost its keen edge, while the sun was not yet too hot to wear blue clothing, or to admit of brisk exercise; spurts of wind from south and south-east had occurred for the last month, and taking advantage of it, two divisions of the Chinese grain junks had already started for Pekin: the first division, with some eight thousand tons of rice, &c., had arrived at the capital; the second division started about the time we arrived in the river, and when the Chinese officials at Shanghai learned the possibility of hostilities, the greatest anxiety was expressed lest we should occasion a famine in the North and in Pekin by intercepting these supplies. The rebellion in the valley of the Yang-ze-kiang, the occupation of Ching-kiang-fu on the Great Canal, and the unruly Hoang-Ho, or Yellow River, having left its bed and taken some other course, had all combined to force the old canal traffic between Northern and Southern China into a coasting trade: and it said a good deal for the energy and nautical enterprise of the Chinese that they had thus quickly adapted themselves to circumstances, and undertaken to convey not only luxuries, but actually food to the northern provinces, in the same description of vessels with which I perfectly remember seeing them navigate the smooth waters of the Yang-ze-kiang in former days. With such a people I maintain it is folly to say that they will "break before they will bend." They are only Asiatics; *make them do a thing*—compel them to advance—and they will do it as well as any of us; but consult their prejudices, or their ease, and good bye to any change or advancement. They are to us what the child is to the man: bear that in mind—treat them as children; make them do what we know is for their benefit, as well as our own, and all difficulties with China are at an end.

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* The Custom House returns for 1857, published at Shanghai by the head of the Anglo-Chinese Customs, Mr. H. N. Lay, show for 1857, 16,239,696*l.*, general trade; opium, 3,243,288*l.*; treasure, 4,846,260*l.*; copper coin, 444,774*l.* Total, 26,774,018*l.*!!!

Between the Amherst Rocks at the northern entrance of the Yang-ze and Shantung Point, we steamed and sailed in, generally speaking, smooth water, although sharp breezes of short duration sprang up alternately from north-north-east and south; the latter bringing with it a low white mist, through which the quaint hulls and quainter cut sails of many Chinese junks were constantly seen. The majority of these vessels were recognised by their peculiar form to be from Shanghai, or the Yang-ze-kiang, whilst here and there those of Fu-chow-fu, Amoy, and Canton were distinguished by certain forms of hull, cut of sail, or eccentricity in their paint; for it is as easy to recognise the junks belonging to the different provinces of the sea-board of China—indeed to distinguish the fishing boats of one portion of the coast from those of another—as it is when running up the English Channel to know a Cawsand-Bay smack from an Isle of Wight wherry, or Brighton cobble. Be it remembered, however, that it is only in the external form and paint of his junk, or cut of his sails, that the Chinaman of the South differs from him of the North. In all the internal fittings and nautical gear there is not the slightest difference. In all sea-going junks the rudder lifts or lowers at pleasure, the tiller is equally long, the sails are similarly fitted, and the wooden anchor and coir-cable work upon immutable principles, which would delight such ancient mariners of Europe as weep over the departed days of hemp cables and shingle ballast. This unconservative departure from certain fixed laws which the Chinaman allows himself in junk-building is, however, of this much use to the European, that in thick weather our opium-clippers and packets, running up and down the coast, often know they are off a certain port or district by the appearance of the fishing boats working about in the offing.

The uniformity of the soundings, as well as nature of the bottom, the *Furious* sailed over in the 360 miles of sea intervening between the mouths of the Yang-ze-kiang and Shantung Point, proved we were still travelling over a submarine region, formed by the alluvial deposits of those twin giants, the Hoang-Ho and Yang-ze-kiang; and it was deeply interesting to think that at some future day the plain beneath our keel would, by accumulated deposits, rise to low-water mark, and then, like much of the adjacent coast of China, be immediately seized upon by swarming Chinese, be diked, cultivated, populated, and added to that already wonderful region known as the Great Plain of China: an event which, judging by the rapid formation of Tsung-ming, Bush Island, and other spots in this neighbourhood, is not so far distant as many might suppose. After a run of nearly 400 miles on a north course, we reached the Shantung promontory, and entered what has been called the Yellow Sea, though I know not with what justice, for its waters struck me to be of a purer pale sea green than those of the region we had left behind us, or those of the Gulf of Pecheli, which we afterwards entered. There was now a decided decrease in the temperature of the air, and at nights it was even in our cabins as low as 58° Fahr. Daylight of April 13th found us off Alceste Island, and as we steered to the westward for the Straits of Mia-tao, a cold south-east breeze from the high lands of Shantung rolled back the night mists from hill and valley, displaying under a rising sun a glorious and striking panorama, which, though perhaps not so rich as the valley we had been so long in, to the southward, was far more preferable to the eye. Leu-cung Island and Wei-hai-wei harbour were soon passed, and it took us all the forenoon to cross the broad unsheltered bay, at the eastern horn of which stands the now important city of Che-chow-fu. Great numbers of junks were working close along shore: most of them, possibly from fear of us, passed inside the numerous islets forming the Che-fow harbour of our charts.

This anchorage, of which we have a survey by Lieutenant D. Ross, of the Bombay marine, made in the year 1816, only affords partial shelter to north-east and east gales, which are, I should think, those most to be avoided in this sea. A French frigate lately anchored in the bay, and in a north-east breeze pitched bows under in a tremendous sea, with 180 fathoms of cable on a single anchor. Outside, and bearing about north-east by east ¾ of a mile distant from the outer island, called North Island, we observed breakers which are not marked in the charts, showing that although the survey is generally correct, so far as cross-bearings and transits of the points would allow us to form an idea, it must have been hastily done. From Che-fu Point to Teng-chow-fu, a large city 30 miles W.N.W. of the former, the land was very picturesque, the coast slightly indented, but with no appearance of secure harbours. The scenery of Shantung, the peculiar form of the hills, and the natural or artificial tumuli which appeared to crown their summits, or rise from the level plateaus, recalled strongly to mind the peninsulas of Taman and Kertch, on the shores of the Black Sea. The resemblance led to speculation in my mind as to the connection between two points so far apart upon the globe's surface. Both were in Asia; both spots were on the southern edge of the great Tartarian region, and in about the same degree of north latitude; over both, at no very remote period, nomadic tribes of the same great family had wandered as conquerors or fugitives, and erected those silent yet expressive tumuli, either as tokens of their sovereignty, or in barbaric honour of departed warrior chiefs. Those in the far West were now in the hands of the warlike Russian, to be hollowed out into Mamelons and Malakoffs for the good of the orthodox faith; these before us in the East had been seized upon by the Chinese, a far more practical race, who, alas for the poetry of the act! turned these chambers, fashioned for the post-mortem revels of the mounted Viking of Tartary, into lime and brick-kilns! if not yet viler purposes.

Ugly shoals and broken water showed on either side of the city of Teng-chow-fu,* and as the *Furious* rattled along under steam and sail, the extensive battlements of the city struck even me, who was fresh from the great Chinese towns of Canton and Shanghai, as enclosing an area larger than any before seen. Teng-chow-fu stands upon a level, which rises somewhat abruptly from the sea for a hundred feet or so. Within its walls, and at the N.W. angle, is a conical hill, crowned with a temple. Not far in the rear the lofty hills of Shangking are seen, and the ground rises on the eastern and western sides of the city; indeed, in a military point of view, the walls are dominated by a ridge of hills running out to the east, and from the extreme point of which the Gulf of Pecheli may be said to commence.

The best information we possess of Teng-chow-fu, and that meagre enough, is to be found in the voluminous narrative of Lord Macartney's embassy to China in 1793; and as it is now one of the new ports open for European commerce, and likely to play an important part as the emporium of Northern China, I shall take the liberty of briefly transcribing the remarks contained in that work.

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* It is hopeless to profess to be correct about the pronunciation or orthography of names of places in China, so long as those learned in such matters differ in opinion. The Admiralty Chart calls it "Teng-chu-fu;" Lord Macartney writes it "Ten-choo-foo;" Mr. Williams, the American, in his map spells it "Tang-chau-fu;" and so on.

After mentioning that the walls of Teng-chow-fu enclosed more ground than was occupied by houses, a remark, by-the-bye, applicable to all Chinese cities, the writer proceeds to say,—

> "The bay, or rather road, of Teng-chow-fu, not only is open to the eastward and westward, but is not well sheltered from the northward, the Mia-tao islands being too distant to break off much of either wind or swell from that quarter. The anchoring-ground consists, in great part, of hard, sharp rocks; and at about a mile and a quarter from the shore is a dangerous reef, covered at high water, extending nearly a mile, east and west, round which the water shoals so suddenly as to render any approach to it very perilous. At Teng-chow-fu is constructed a kind of dock or basin for vessels to load or discharge their cargoes. The entrance into it is between two piers, and is from 30 to 40 feet in width. The ground near the sea-coast is richly cultivated, and rises in a gentle ascent until terminated by high, broken, and barren mountains, apparently granitic. The rise and fall of the tides in the Strait of Mia-tao are about 7 feet. The flood-tide runs *east*, towards the sea; the ebb runs to the *westward*, into the Gulf of Pekin."

This latter piece of information applies, perhaps, to the eddy tide in the anchorage off Teng-chow-fu, for when the *Furious* struck on an unknown sandbank in passing through these straits (at a later hour in the afternoon), we found the ebb-tide running, as it should do, out of the Gulf of Pecheli; and it will be hereafter shown that off the Peiho River the flood and ebb evidently, from their direction, run in and out of the gulf.

The evening of the 13th April was now closing in; we had a rattling breeze behind us, with every token of an increase both in the appearance of the sky and fall of the barometer, and I knew that at this season dense fogs might be expected, with an almost unknown sea before me. There was no anchorage east of the Mia-tao Islands, and consequently no time was to be lost in pushing through the straits, so as to have sea-room in the Gulf of Pecheli. I had been cautioned by the Russian officers who visited this channel in 1857 not to trust the charts as to the limit of the extensive shoal which runs out from the Shantung coast, and projects in a N.W. direction, but to borrow freely upon the starboard hand, as the islands of Chang-shan and Ta-he-san were steep to. Keeping this in mind, seeing quite distinctly the sand-spit which runs off from Chang-shan, and observing a large fleet of junks ahead, as well as others running the same way as ourselves, I steered boldly through the strait, but suddenly struck a sandbank almost as steep as a wall, which brought the *Furious* up all standing, with her stem in 11 feet water, her centre in 14 feet, and her afterpart in 5 fathoms. Of course we had gone ashore as a man-of-war should do, according to printed instructions and articles of war—leads going, anchors clear, masthead-man in his station, and the captain, master, and officer of the watch on the paddle-boxes. With a little trouble we were off in deep water again by 6·30 P.M., none the worse for our feat. Had time and circumstances admitted of it, I should have waited until next day to examine this danger; it is either a prolongation of the sand-spit of the Mia-tao Islands, or else a detached patch. I am inclined to think the latter, as it is about three quarters of a mile from the extreme laid down in the charts.* And subsequent to this event, H.M.S. *Sampson*, towing up two gunboats, appears to have scraped so close to it that the bight of the hawser, by which she had a gunboat in tow, fouled it; and the gunboat *Lees*, running out of the gulf in the same spot, suddenly shoaled her water from several fathoms to 13 feet, the spit from the island being at the time plainly visible.

I have rather dwelt upon this subject to show how much necessity there is here for an active nautical survey, and I think the good people at home should dispense for awhile with home surveys, which only bring to light such interesting little facts as that Dungarvan Harbour has shoaled 6 inches in 200 years; and let the great highroads of commerce or empire, fast opening in the East, be rendered safe for the merchant-ship and man-of-war. This work should not be confined to British surveyors—the Americans ought to join us in making a complete survey of the seas and coast from the entrance of the Yang-ze-kiang to the river Amúr. As yet they have left the whole onus and expense to England, and all the many millions' worth of foreign property carried to and fro on the coasts and in the rivers are indebted for safety to the admirable charts of English officers.

Aided by fine weather, during the first watch we felt our way carefully through the Straits of Mia-tao, passed some hundreds of large junks at anchor in the sheltered anchorage between the shoals of Teng-chow-fu and the southern islands, and at 10·30 again put the ship before the breeze and shaped a course for the bar of the Peiho river, across the surface of the Gulf of Pecheli.

Before we pass from the shores of the province of Shantung to those of Chili we must dwell for a few minutes on the geography of that division of the Chinese empire. Its area is just that of England, Scotland, and Wales! its population exceeds that of Great

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* Position of H. M. S. *Furious* when aground:—East extreme of Long Island (Chang-shan) just open of the south extreme, and the west extreme of Ta-he-san Island N.W. by W.

Britain and Ireland by exactly half a million souls! In latitude it agrees with the southern and fairest portions of Spain and Italy, but the extremes of heat and cold in summer and winter are far greater, though these are much modified by one half the borders of the province being washed by the sea. The western half of Shantung is a dead level, forming a portion of that wonderfully rich region known as the Great Plain of China,—a plain which rolls to the south from Pekin, in 39° N. latitude, gradually extending in width until its huge base rests, at a distance of 600 miles, against the base of the mountains of Che-keang and Kiang-si. The only highland which intervenes between this plain and the sea is the mass of mountain, peak, and plateau forming Eastern Shangtung. It looks as if in remote ages it had once been an island, and had been connected with China Proper by the silting up of the intervening sea; just as, in process of time, the Gulf of Pecheli will be filled up if, as it is now said, the erratic Hoang-Ho has returned to its ancient bed, and discharges its waters into the south-west bight of the Gulf of Pecheli.

The Chinese, speaking of this province, do not think very highly of its resources, as compared, of course, with those of the fat soil of the delta of the Yang-ze-Kiang; but it seems likely, from its products and climate, to play an important part in European commerce. Coal and iron are abundant, and, it is said, largely exported to other parts of China by the natives. Its fruits are famous for their size, if they be not so for flavour, throughout the whole seaboard of the empire, and we were eyewitnesses of the prodigious quantity of millet and beans it contributed to the supply of the capital, shipped in strong-built junks, not unlike Dutch galliots, and manned by a race of seamen who, for pluck and independence, would not yield much to those of Northern Europe.

To Teng-chow-fu the foreign missions to be hereafter stationed in Pekin will undoubtedly come to escape the monotony of their solitary existence in the imperial city, as well as to enjoy a climate which, during the six weeks of midsummer or midwinter, will be infinitely preferable to that of Pekin; and when the severity of the Manchurian winter closes the Gulf of Pecheli to our traders, they will doubtless congregate at this convenient emporium, and thence by land supply the traders of North China, as well as the Corea, with such British staples as they must assuredly desire; and I feel convinced, without being a prophet, that within ten years' time we shall see at Teng-chow-fu as flourishing a settlement created by the commerce of Shantung, Chili, Shensi, and Shansi, as that of Central China can show in the great city of Shanghai.

By the next mail I hope to be able to send my notes on the Gulf of Pecheli, the Peiho, and the commercial and political advantages likely to accrue from Lord Elgin having succeeded in inducing the Chinese to open the port of Neu-chong in Shingking province, the seaport of Moukden, capital of Manchuria.

The map of China, by Mr. Williams, published by Mr. Atwood of New York, contains a better *general* view of China than any now published; but, for particular districts, those published by Mr. Arrowsmith of Soho Square, one of which, embracing nearly all the region upon which I have touched in this paper, lies before me, and, except in nomenclature, is wonderfully correct, and, although not acknowledged, is evidently the basis of the map by Williams.

PART II.

Notes, Geographical and Commercial, upon the Gulf of Pecheli and the Peiho River.[*]

BEFORE entering on a description of the Gulf, and turning my back finally upon the Strait of Mia-tao, it is right that I should say that it affords the only really secure anchorage, in a seaman's acceptance of the term, between Shantung Point and the bar of the Peiho river. A glance at the chart will show how the islands to the north, the sandspit of Chang-shan to the east, the coast of Shantung to the south, and the shoals of Teng-chow-fu Point to the west, shield the roadstead of Mia-tao on every side from the seas adjacent, whilst vessels desirous of seeking a still quieter spot for discharging cargo and repairing damages, have but to anchor between the islands of Mia-tao and Chang-shan. The bottom throughout is mud, or mud and sand; depths to be found at choice from 7 to 4 fathoms. The islands are inhabited; fresh water is abundant, and such supplies as may be needed and they do not afford, may be easily procured from Teng-chow-fu, only 5 miles distant. If, as I fully anticipate, a few short years hence this anchorage be much frequented by European shipping, it will be the seaport, so to speak, of Teng-chow-fu, and a colony of all those who live by, and live upon, the merchant, ship-master, and ship-owner will be rapidly formed on either Mia-tao or Chang-shan.

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[*] *See* the 2nd Vol. of the "Proceedings" R. G. S. at p. 362, for an extract from Captain R. Woodbine Parish, R.A., Notes upon the Passage up the Peiho with Lord Macartney in 1793.—ED.

We found, as I have before said, vast numbers of junks riding at anchor in the Strait. It is from this spot, as I learned at Shanghai, that the native traders from the south take their departure afresh for the ports of Manchuria (or Shingking), the Corea, or Chili. Those bound to either of the two former provinces steer north along the islands which guard the entrance of the Gulf, until they strike Cape Lao-thie-shan (the extreme of a peninsula strangely named in our maps the Regent's Sword): thence they diverge on their respective coasting voyages; whilst the grain-junks bound to the Peiho River take advantage of a propitious breeze, and strike direct for it across the Gulf from Mia-tao Strait.

Thither we must now follow the *Furious*, which through a muddy sea and murky atmosphere, which sadly limited the circle of vision, staggered before a freshening breeze, in never more than twelve fathoms water, for the low and shallow coast of Chili. Knowing how limited was our knowledge of this sea, how scant the soundings, the set of currents, or existence of shoals or rocks, one might have been serious or anxious in thus plunging along at a speed of eight knots per hour, had it not been that we were constantly sighting some queer-looking "argosy" of China, rolling along like nothing else earthly but what she was—"a junk at sea," and the feeling that a sea which a Chinaman can navigate in such clumsy craft ought to be and is child's play to an English seaman.

At noon, on April 14th, we found by observations obtained that the current had set the ship 2·2 miles per hour to the south-west since entering the Gulf, and we altered course accordingly. This southerly current we had subsequently reason to believe to be very frequent, if not constant, at this season of the year, for nearly all the vessels which made the traverse experienced it, in a more or less degree, until the end of May, and it is so far advantageous that it will always keep a ship clear of the Sha-lin-tien shoals, and of her approach to the coast the lead-line will always give ample warning. The cause of such a current is very easily explainable. A prodigious discharge of water, occasioned by summer thaws, must, in March, April, May, and June, be thrown into the Gulfs of Leo-tung and Pecheli from the high lands and snow-covered plains of Mongolia and Manchuria. The surplus of what is not carried off by evaporation must flow southward into the Yellow Sea, naturally causing a constant current in that direction, only partially checked by the flood-tide.

From noon the soundings gradually decreased; many junks were seen on every hand, standing in the same way as ourselves, and just as we had run by patent log the distance from our position at 12 o'clock to the 6 fathoms marked on the Admiralty chart of the Gulf of Pecheli, we obtained exactly that amount of water and saw the land rise like a black line out of the waters on the western horizon, proving that the chart was so far very correct.

Running into 4 fathoms water, and sighting the leading marks over the bar of the Peiho River—a bar which we did not *then* despair of carrying the *Furious* across—we shortened sail, and anchored close to the Russian war-steamer *America*, bearing the flag of the Admiral and Plenipotentiary Count Putiatin. Shortly afterwards, H. M. S. *Pique*, Captain Sir F. Nicolson, joined us.

It must be acknowledged that our anchorage, as well as the view of the adjacent coast, was far from cheering. We were 8½ miles off the shore, with only 22 feet under our keel at low-water. The sea was of a thick muddy colour, the sky murky and misty. Very indistinctly visible to the westward the low land at the mouth of the Peiho was seen dancing from the effects of refraction, whilst three eminences, more marked in outline than the rest, denoted the position of the forts and batteries of Taku, which, of course, we well knew, in spite of the surf, the bar, and all the Tartars in Mongolia, would very shortly be ours.

At night the breeze slackened somewhat, and the sea became overspread with phosphoric light, as brilliant as any ever witnessed in equatorial regions; this, however, only took place once or twice, and that during the early period of our stay in the Gulf, and it is right that I should say that the very muddy condition of the sea-water gradually abated as the season advanced, and in July the water at the anchorage was simply of a turbid sea-green colour. This change arises, probably, from the rivers having ceased to throw so large a volume into the Gulf of Pecheli after the snows of the uplands had melted away, and because the constant action of the southerly monsoon forces in more salt-water from the seas beyond: an opinion substantiated somewhat by the increased depth of water at the *Furious's* anchorage of no less than one foot during the three months she remained there, the south-west monsoon having commenced.

Time, however, reconciled us considerably to the apparent deficiencies of the anchorage we were in, and I have no hesitation in saying that, as a summer holding-ground, it is sufficiently safe—that is, from April 14th to the end of September. Vessels, we know, have been much later at it, and in a steamer, with good anchors and cables, the roadstead might be used until the winter ice, which forms in the rivers, compelled her to start for Mia-tao Strait. During the eleven weeks the *Furious* and squadron remained at the anchorage, smart double-reef topsail-breezes were frequent, and sometimes very heavy squalls, in which the wind shifted abruptly, and blew equally hard from south-east to north-west or south-west to north. The sea that arose on these occasions was never trying to the ships, neither did any of them have to get down their topgallant-masts on account of the weather; but for boat-work, intercommunication between vessels or with the shore, or to discharge the cargoes of merchantmen, there was often sufficient sea to render such operations hazardous, if not impossible. The heaviest sea experienced was from the south-east, the drift of the waves from that direction being the greatest; that from north-east gales, which in the offing make perhaps the heaviest sea experienced in the Gulf, being broken where ships lie at anchor by the extensive sandbanks known as the Sha-lin-tien Shoals, of which a very good chart was published by the Admiralty, in the year 1840, compiled by Mr. Norsworthy, of H. M. S. *Pylades.* To complete my remarks on this anchorage, I annex the observations made by an excellent officer, Mr. Stephen Court, Master of H. M. S. *Furious,* together with a tide-table, kept by my officers and checked by myself.

The most important points to be deduced from those tidal observations are that the rise and fall is 9 feet at spring-tides, and that the time of high-water at the full and change of the moon is at 4h. 8m.; whereas the rise and fall had formerly been stated to be as much as 11 feet, and the time of high-water had been variously stated as at 3h. 38m. and 2h. 45m.

From the Gulf of Pecheli it is now time to turn to the Peiho River. The Peiho, which, being translated, means "the North River," has its sources in the high lands at no great distance beyond Pekin, and runs for the major portion of its tortuous course through a level country, the velocity of its stream, rather than the volume of its water, having scoured out a narrow bed in the stiff clay which forms the substratum of the plain of Chili. This scouring force, however, becomes so weakened as it approaches the sea, owing to the low level of the shores allowing a constant overflow, that instead of cutting a 12-feet channel straight out into the Gulf of Pecheli, the depth of the river suddenly decreases, and the river discharges itself over an area several miles in extent, forming what is known as the Bar.

The best, indeed the only, chart we possess of the bar of the Peiho River is the American one, a tracing of which accompanies this paper, and I can testify to its general correctness, except that the water found by the Americans on the bar is nearly two feet deeper at low water, than it is at present—an error probably caused from computation, instead of doing as we did, remaining constantly upon the bar from high water to dead low water. My corrections are upon the chart.

The manner in which this, the American, chart came into my possession, and afterwards into general use throughout the squadron, is a proof of the necessity for a better understanding between geographers of different countries, and a more frequent interchange of information collected by each. I will state the circumstances to exemplify the case:—Prior to leaving Hongkong in March, 1858, a conviction that the ultimate result of our Canton operations would be to carry the *Furious* and the British Ambassador to the Peiho River, *if not to Pekin*, induced me to seek carefully for any information bearing upon that part of China. I soon found that in the British chart-boxes there was nothing about the Peiho beyond the fact that the Hon. Company's steamer *Madagascar* had once crossed the bar, but there was no certainty as to what water she carried over it. The French, of course, were equally ignorant; but from Mr. Reed, the American ambassador, as well as Captain Du Pont of the U.S. frigate *Minnesota*, I learned that, much to their astonishment, Count Putiatin, the Russian envoy, had shown them an *American Survey* of the bar of the Peiho River, made by the officers of the *John Hancock*, of which they had been previously ignorant, and of which no copy had even been supplied them from the Hydrographic Bureau at Washington. That it was authentic, however, there could be no doubt, and the good folks of the United States can best explain how it was that a Russian could procure a copy of an official record before it was furnished to their own accredited minister. Count Putiatin made no secret of his valuable document, and when we arrived at Shanghai, and found him there, he very kindly allowed me to make a copy of it, and added some kind and valuable information touching the tides off the Peiho and the dangers in Mia-tao Strait. Directly the *Pique*, Captain Sir F. Nicolson, joined the *Furious* off the Peiho River, I was able to lend him the American chart to copy, and we subsequently did as much for the flag-ship.

With that chart and one of the river to Tientsin, of which the Royal Geographical Society may procure a copy from the Admiralty,* it will be easy to understand the following remarks:—The bar of the

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* A very fair chart of the river from Taku to Tientsin was made by Mr. Vine, second master of H. M. S. *Coromandel*, and a copy of it, I am told, transmitted to the Admiralty by the Admiral.

Peiho River, measured on the seaward side, extends in a great curve of 6 miles in length, and at its narrowest point between the deep water within and without it is 2 miles wide. It consists of very stiff clay, with a few patches of shingle here and there; the whole overlaid by 9 or 10 inches of earthy deposit from the river. At low water spring tides we only found 2 feet water upon the bar in the deepest places; indeed, on more than one occasion whilst living upon it in boats (as Mr. Court the master, and I, did for a fortnight), we often found that a stiff breeze off shore reduced the water to only a foot in depth. The deepest water observed in calm weather, when such observations could be relied upon, showed a depth of rather more than 11 feet. The time of high water and the amount of rise and fall agreed admirably with that observed on board H.M.S. *Furious*, viz. H.W. at F. & C. of ☾ 4h. 8m., and rise and fall = 9 English feet. It is, however, possible that in the Gulf of Pecheli, as in other shallow, land-locked seas, these data are to some degree dependent upon the season of year; and that winds of a certain force or from certain directions may at other seasons retard or hasten the time of high water, and affect the height of water upon the bar to the extent of a foot or 18 inches. At any rate, it is certain that vessels drawing 10 ft. 8 in. can easily cross the bar of the Peiho at spring tides, and on interrogating the masters of trading junks, through an interpreter, I learned that the largest vessels trading with Tientsin, varying from 300 to 500 tons burden, never exceeded 11 English feet in draught. The Chinese mark the channel over the bar with bamboos; their positions when we arrived were inserted in the chart, but, as they subsequently cut some of these bamboos away, we replaced them with buoys, by means of which the gunboats and despatch vessels of the allied squadron were eventually carried safely over the bar into the Peiho River on May 19th, 1858.

There is no continuous surf upon the bar, but when it blows a fresh breeze from the south-east there is quite enough sea on to render the bar highly dangerous for open boats; indeed the smallest native craft used in this neighbourhood are decked. My own impression is that when the Imperial Government grows wiser it will be very easy to cut a channel through the bar, and that by driving a few piles along its margin to confine the force of the current in the same direction, a passage for junks will be made fit for all times of tide. The force of the current of the Peiho River at its mouth is always much affected by the direction of the wind; in calms it runs from 2 to 2½ knots per hour. During the first three hours of the flood and the last three of the ebb tide the current sets directly in and out over the bar, but whilst the tide is high enough to cover the mud flats, the direction of the current follows that of the tides in the offing.

Directly the bar is crossed a deep channel is entered, which, although tortuous, has never less than 12 feet water in it, and in many places much more, all the way from the entrance to Tientsin. Off some of the salient points where the river takes a sharp turn, projecting spits of mud or sand are sometimes found, but the general character was uniform, namely a muddy stream running through flat country, wonderfully free from all obstructions, and the channel generally steep to the river bank. There are strong indications of vernal and autumnal inundations during the ascent of the first 15 miles, but beyond that distance the river banks as far as Tientsin were nowhere artificial, but rose with a natural abrupt escarp 3 to 6 feet above high-water mark. It would be difficult to account for the sharp bends in this river or its generally tortuous course, seeing that it runs through a plain as level as a table, and has had apparently only to cut its way through stiff blue or yellow clay; nevertheless, in the short distance of 30 miles which intervenes between the city of Tientsin and Taku, at its mouth, the river turns and twists over not less than 50 miles of ground, very much as laid down in the chart accompanying the account of Lord Macartney's embassy to Pekin in 1793—which chart, however, is decidedly very incorrect directly Tientsin is passed.*

Apart from the natural excitement of breaking in on new ground as belligerents, nothing could be less interesting than the first part of the ascent of the Peiho River. On either hand extended a dreary mud flat, which looked as if it had been only yesterday wrung from the sea. Reeds, rushes, and such plants as love a marshy or saline soil, are seen in patches; but the major portion is nought but a saline, the glistening product of which, piled in great pyramids by the thrifty Chinese, breaks the uniformity of the scenery. The banks of the river are, however, turned to every possible advantage by a swarming population. Mud-built villages commence within a mile of the entrance: the largest of them, "Taku," has now become well known as the scene of late hostilities—"a *crowning mercy*" which its unfortunate but strong-smelling inhabitants will long have occasion to remember. Wretched, dirty, and foul-smelling though these villages appear to the eye of an European, they are, in fact, exceeding rich with the hoarded fruits of commercial and agricultural industry, and the plunder carried off by the Allies from Taku, which looked about as wretched as Worthing does in the month of January, could not have been found by the most experienced leader of a "Razzia" in anything smaller than one of our large cities. In front of each of these villages fleets of junks were anchored or hauled into mud docks cut in the banks; the majority were grain-vessels or vessels pressed into that service by our active friend the Taoutae of Shanghai, who remorselessly applies to his master's service the shipping of Amoy, Fu-chow-fu, Shanghai, or Shangtung, paying them only a small nominal freight—an act of oppression against which, instead of murmuring, the Chinese shipmaster quietly indemnifies himself by carrying a small venture of European produce, opium, cottons, and lucifer matches, &c., which he charges an enormous price upon, and cheats the government of all taxes and dues.

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* *See* Admiralty Chart of R. Peiho, by Capt. R. Woodbine Parish, R.N. Published March 17th, 1857.—Ed.

Beyond the first 15 miles the Peiho improves rapidly: the soil overlieing the clay stratum increases in depth and fertility, signs of agriculture increase on either hand, fields of Indian corn, millet, bearded wheat, lettuces, and radishes, follow in rapid succession. The villages are embosomed in fruit orchards, or hide their ugliness in groves of handsome trees. Some of the reaches of the river become exceedingly picturesque, although there is a lack of the grotesque temple and quaint pagoda which give so marked a character to Chinese scenery in the south. From the masthead of the gunboat I was in, the villages, population, and cultivation appeared confined to the immediate vicinity of the Peiho, in two belts, varying from 2 to 4 miles in width. This I could only account for by the want of water elsewhere, and it was remarkable that in a distance of 50 miles we only counted two small streams or creeks flowing into the Peiho. Beyond this belt of cultivation and its teeming population a dreary steppe was seen extending, on which trees were scarce and the houses few and isolated. It put me much in mind of the interminable plains of Russia: however, I do not mean to assert that the plain of Chili is uninhabited, but that it is so by comparison with the borders of the fresh-water streams, of which there are several flowing into the sea besides the Peiho, if the Chinese are to be believed. I counted at one time no less than 25 villages in sight from the masthead, and often 10 or 15 were visible: they were none of them ruined in condition, and all appeared full of inhabitants—stalwart naked labourers and hosts of noisy healthy children; women were not seen until afterwards, and of them there was no lack. Our first arrival as the "avant-garde" of the squadron was a startling event to these poor villagers; but a stranger sight was the whole male population of a village ranged along the bank, on their hands and knees, and performing "kotow" as our gunboats passed, it would be difficult to witness. Besides this form of respect and reverence for the Fanqui, they each offered a token of peace and amity in the shape of a fowl, and here and there some, more frightened than the rest, shouted to the interpreter, Mr. H. N. Lay, "Hail, great king! Oh pray be pleased to disembark and reign over us!" One man at a village, who I fancy was a Christian convert, improved upon the proceedings by placing himself on his knees in the position of adoration, and continued so as long as H.M. gunboat *Bustard* remained in sight. He, poor fellow, was no doubt anxious to propitiate the demon that had so suddenly burst upon the quietude of his Chinese village; but the application of his Christian teaching was as original as that of some Sandwich Islanders, who I heard not many years ago singing the 64th Psalm to soothe a heathen goddess who presides over their troublesome volcano.

A reach, 3 miles long in a straight line, brought us in sight of the city of Tientsin, and the salt-heaps or magazines for which the city is famous commence at the end of this reach, near the remains of an old ruined tower which once guarded this approach. Owing to my consort, the *Staunch*, having grounded in this said reach in trying to turn under steam, it became my good fortune to enter Tientsin alone on board the *Bustard*, commanded by Lieut. Hallowes. The interest of that forenoon's work, May 26, 1858, will not be easily effaced from my memory. As every fresh point mentioned by Barrow and Ellis came in sight, I could not but recall with some degree of elation the altered circumstances under which the British flag now made its appearance. Then over the craft bearing our Ambassador floated a flag on which was written the lie that he was bearing tribute to a Chinese Emperor; mandarins and rabble indulged in all their impertinences and arrogance; and whereas then his audience with the Emperor took place to the air of "subjugation perfected!" by a Pekin band, it now appeared more than probable that an English one would shortly be performing "God save the Queen!" in the same spot. As our tiny craft with her crew of seamen and marines from the *Furious* sped on, we came abreast of the huge pyramids of salt, 100 feet high and 200 feet long, which formed a magnificent defence, and we naturally hoped to see a gun appear in sight to add some *eclat* to our capture of Tientsin. But we looked in vain; not an armed man was visible anywhere. We now passed into the southern suburbs of the city—a long row of dingy hovels, the one on the eastern shore being the most extensive—or rather I ought to have said we screwed in between two long rows of human beings, piled head above head as thick as standing room would admit.

Astonishment, wonder, and curiosity had mastered all their fears. Presently we saw a bridge of boats extending across ahead, and beyond it the river evidently made a sharp bend to the right, whilst on the left, the mouth of the Great Canal was distinctly visible. We all cheered with delight; we felt Tientsin was ours, and that in it we held, to use the figurative language of Shanghai, the throat of China! Although the mob officiously opened the bridge and appeared anxious to cheer us onward, I felt it was my duty to take up a position for sweeping the southern face of the city walls, and as they were now only a few hundred yards off, I anchored at the bridge. Two conspicuous public buildings were visible from the *Bustard*; one ahead looked down the reach, which from its importance we supposed to be the Temple at which, in 1793, Lord Macartney was met by the Emperor's Legate. This building subsequently became the abode of the allied Ambassadors. The other was only seen from the masthead: it was a handsome isolated building on the plain, about 1200 yards distance from the river; its gorgeous painting attracted our attention, and it strangely enough was the place in which the treaty of Tientsin was eventually signed. It was named by the Chinese "the Temple of the Glory of the Ocean."

Hardly had our anchor reached the bottom before Chinamen and boys began to swim off with fowls, eggs, fruit, and vegetables for sale; and as our seamen were revelling in a degree of wealth which was particularly irksome to them, consisting of copper coin captured in the batteries of Taku, the good folk of Tientsin were not a little astonished at the wonderful amount of wealth thus strangely pouring in upon them, and evinced every anxiety to take all possible advantage of it. In the height of the excitement, which our men increased to fever heat by showering handfuls of cash among the crowd for a scramble, a midshipman stationed aloft reported that a large body of Chinese troops were quitting the Temple of the Glory of the Ocean and marching into the city. The pivot-gun was rapidly cleared away and pointed over the crowd: the buyers and sellers became sadly agitated between fear and cupidity. We made signs that all we required was room enough to fire at their countrymen; they appreciated the joke amazingly, cleared a space 50 yards wide in front of the gun's muzzle, and then sat down to see the fun. Happily for the retreating soldiery, as well as for the Temple of the Glory of the Ocean, the *Bustard's* gun could not be sufficiently elevated to clear the adjacent housetops, and I was unwilling to fire through them at the mandarins without some provocation, otherwise it is possible that His Excellency Lord Elgin would not have found that said temple sufficiently wind and water-tight for those conferences, which have eventually led to the glorious treaty of Tientsin being signed within its walls.

Having sent the boats of the *Furious* into the Great Canal, to be able to say that my ship's boats had been the first European ones to reach the northern end of that remarkable work, a piece of selfishness for which I hope to be pardoned, I returned in my galley to meet the *Coromandel*, bearing the flag of the Commander-in-Chief, who joined us an hour or two afterwards.

Tientsin consists of a small walled city, built in the form of a square, each face as nearly as possible a mile long, and each facing to the four cardinal points of the compass. In the centre of each of the time-worn walls a single gate opens out, giving only four outlets, a pretty good proof that it is not a very large place, and has not a very numerous population. It stands at the angle formed between the south bank of the Great Canal and the river Peiho, but its walls are from two to three hundred yards from the water's edge. Suburbs of some extent lie to the north and west and east, but on the plain facing the southern wall, few, if any, houses are seen. These suburbs consist for the major part, as does the city, of mud-built houses, giving the whole place an appearance of meanness and poverty, little in keeping with the general reputation of Tientsin for wealth and commercial importance. Previous travellers have, they say, been always struck with the numbers and busy character of its population; we were disappointed in both respects, but it is possible that the circumstances under which we visited it may account for the seeming inactivity of the people ashore and afloat. The population, such as we saw, never exceeded 100,000 souls, yet the residents vowed that there were half a million souls in Tientsin. All the prodigious floating population had naturally fled in their boats, and moreover it is quite possible that Tientsin, like Nijni-Novgorod or other great marts of Russia and Siberia, becomes at times densely populated with merchants, boatmen, and other frequenters of fairs, and often relapses into what we saw it, a dull, dirty town with no large fixed population, and not exhibiting (because it does not retain) any of the wealth which is constantly passing through it.

The streets within the city ran for the most part at right angles to each other; in the suburbs they were far more eccentric: all were excessively ill-kept, and of all the strong-smelling places it has been my hard fate to visit in this land of strong and foul smells, Tientsin city and suburbs—streets, houses, and inhabitants—are the most disagreeable. They seem to be aware of it, and feed largely upon garlic to master the difficulty; but to a visitor the odour is perfectly capable of giving one nose-ache. All the water drank by the inhabitants is either that of the river or canal, and all day long thousands of stalwart water-bearers are rushing in and out of the city on four paved causeways especially intended for that purpose. This water as it is drawn is full of foreign matter and muddy: the Chinese clear it by putting into it a very small quantity of alum—a practice it became necessary to adopt ourselves, as the river-water, in its natural state, gave our men diarrhœa. Next to the vast store of salt which lined the river banks, the wood stores of Tientsin appeared very important and valuable. Acres of ground were covered with magnificent slabs of beech-wood, most of them 100 feet long, and from 4 to 9 inches thick. This wood enters largely into the construction of river craft in the province, and, in spite of its tendency to sun-rents, when coated with Chinese varnish, and wetted twice or thrice a day with water, stands the powerful sun of Northern China remarkably well. Nearly every house in the suburbs was a shop: those to which we gained admittance were very well furnished with the products of different parts of China; articles from the southern and west provinces—Yunnan, Quantung, and Fokien, &c.—being dear, showing the want of greater facilities of interchange. Other articles—such as rattans, canes, peppers, spices, sugar, &c.—were plentiful: but they, as well as tea, were in great demand, and dear. The profits that would have accrued to importers of all these articles would have been very handsome, and I heard that it would have taken many cargoes to have glutted the market. People at home often suppose tea and sugar to be produced all over China, but as a proof how great must be the demand for sugar alone in Northern China, I would point out from the Custom-house records of Shanghai, the following interesting figures, showing the extraordinary vitality of commerce in China:—

European Imports.—Sugars Imported into Shanghai from Southern China and the Straits of Malacca.

	Sugar Imported. Piculs.		Sugar Imported. Tons.		Value £ sterling.
1855. None imported by European vessels	..		..		..
1856. During the entire year ending June 30th	438,004	=	27,395	=	404,534
1857. During an entire year	529,009	=	33,062	=	751,103
Increase			5,667	=	346,569

I do not deny that it is possible that a portion of this used formerly to be imported in native craft, and that it may only be considered as so much tonnage added to the European carrying trade; still it is said that the native vessels visiting Shanghai have in no wise decreased in number in an equal ratio, which would have been the case, had the trade been merely one of transfer from native to foreign bottoms. Nearly every shop I entered at Tientsin had some article or other of European manufacture; sad trash for the most part, but still high-priced; indeed I saw more British, American, and German articles in Tientsin than the shops of Canton or Shanghai usually exhibited. There being no staple export from Tientsin, the trade there must be purely an import one; and from the profusion of metals we observed here, there could be no difficulty as to purchasing until some products, such as wool, hides, coals, were brought into the market as a return. All the thousands of junks from the south were leaving in ballast, their returns for grain being silver and copper coin. Considering how severely China drains our money-market, we shall have every reason to rejoice if, apart from opium, we can discover some mode of creating a purely import trade in Northern China to balance the exports of the South.

Grain is, and must be, the great article of commerce in Tientsin. Formerly, whilst China was at peace within its borders, the canal perfect, and communication between her rice-producing districts and the capital assured, it would have been difficult to have competed with our Indian rice against the Chinese farmer; but not impossible, for be it remembered we import that grain largely into Canton. But the canal is irredeemably ruined by the Hoang-Ho River having altered its course. Rebellion, ruin, and misery have for years prevailed in Central China; the route by sea has been voluntarily adopted by the authorities. Our rice is largely bought up at Shanghai and sent by junks to Tientsin; as the following figures will show, we have merely to step in as carriers of that grain and to cheapen it. The Shanghai import of rice in European vessels shows the following increase:—

		Rice imported. Piculs.		Value in Taels.		Tons.		Value at Shanghai, £ sterling.
Year 1856	½ year to June 30th..	..		..		..		..
	½ year to Dec. 31st..	110,000	=	220,000	=	7,000	=	7,333
1857	1st half year .. .. 2nd half year	864,637	=	1,810,849	=	54,039	=	603,281
	Increase in one year					47,039	=	595,948

And how dire must be the need in Northern China for rice is best proved by the following facts, which will give some assurance to the trader of the amount of fair profit he may count upon:—

			Dollars.		d.	
Summer of 1858	Rice at Shanghai	=	3	a picul or	2	per lb.
	Rice at Tientsin	=	6	"	4	"
Winter of 1857-1858 ..	Rice at Pekin	=	12	"	8	"

The above price at Pekin was, of course, a famine one, but it was not so at Tientsin, for two-thirds of the grain expected had arrived safely, and the local harvest of wheat was an average; yet we saw hundreds of athletic men starving, and the major portion of the labourers looked but ill-fed on boiled beans and tares, which we should only have fed cattle upon. This trade for the rice of Akyab and Siam will be the first and readiest opened with Northern China, apart from her coasting trade; it will then remain for the Chambers of Commerce of Manchester, Leeds, and Sheffield to bestir themselves, by employing active agents to ascertain the wants of these provinces, and then to strive and produce it *better* and *cheaper* than they can make it. It is very certain that the commercial houses now in China are too well satisfied with the rapid fortunes made in their present course of export trade to speculate in new markets. People who, in three or four years, can clear 30,000*l.* in exporting tea and silks, very justly will object to entering on new lines of commerce. Our import trade into China must be watched and fostered from home, or other nations more enterprising and speculative, will monopolize the metallic wealth which lies fallow in the North of China as it did in the Indies in former days, when all nations bought and none sold there. American drills and Russian broadcloth were plentiful in Tientsin: the former might have some right there; but now that Russia has become too wise to continue to tax those of her subjects who drink tea, so as to furnish Chinamen with cloth cheaper in Pekin than a Russian can buy it at Moscow, the fault will be ours if, in Christmas, 1859, a yard of anything but Yorkshire broadcloth is sold in the province of Chili.

All supplies needed for the table were most abundant at Tientsin; sheep, poultry, vegetables, and fruit procurable to any extent. We ordered beef, and cattle came; there were occasional laments, on the part of the authorities, at our voracious consumption of an animal so useful for agricultural purposes, but there was no lack of them. The following tariff was laid down by the allied Commanders-in-Chief, in concurrence with the magistrates, as fair market prices; and, according to our ideas of money, everything was very cheap.

TARIFF of PRICES established at Tientsin 28th May, 1858.

Bullocks (average 4 cwt.)	10 dollars = 40s. each.
Sheep	2 dollars = 8s.
Fowls (per dozen)	1 dollar = 4s.
Ducks „	2 dollars = 8s.
Geese „	2 dollars = 8s.
Eggs (per 1000)	3 dollars = 12s.
Vegetables (per (picul) cwt.)	1 dollar 50 cts. = 6s.
Ice (per cwt.)	200 cash = 2d.
Pigs according to size	From 1 dollar 50 cts. = 6s.
Yams (per cwt.)	1 dollar = 4s.
Pears and apples (per 100)	1 dollar = 4s.

The Peiho River, as will be seen by reference to the enclosed eye-sketch of Tientsin, turns sharply off to the right (or to the east) just at the junction of the Great Canal, and then recurves back for a mile to the westward before the channel again resumes its northerly and southerly direction. By this strange twist the river gives a vast increase of water frontage to the city and suburbs. Immediately opposite to the salient point formed by this sudden bend, a small canal is seen on the eastern shore, and numbers of small boats, of a peculiarly flat construction, were daily seen coming down it laden with grain and millet seed, and then ascending the Peiho and When-ho Rivers. I believe they came from the city of Lutai, situated on a stream northward of the Peiho, flowing nearly parallel to the lower portion of its course, and discharging itself into the sea about 10 miles north-east of the entrance of the Peiho. This stream we had early information about, and the junk-sailors said it was largely used as a place of import for vessels of lighter draught than those usually ascending the Peiho as high as Tientsin, and that a canal from Lutai enabled boats to convey the cargoes to Tientsin and Pekin. After operations commenced, and trade was totally interrupted in the Peiho, this northern stream was largely used by the Chinese, and fleets of junks varying from 25 to 50 in number were constantly counted going in and out of it. For some reason or other none of the British vessels visited it, but in any future operations against Pekin the blockade of this stream will be as necessary as that of the Peiho. Lutai will be found marked in the map of Chili (or Pe-cheli, as it was then called), drawn by Arrowsmith, to which I alluded in the first part of these papers.

To return to the Peiho. Abreast the town—indeed, throughout the whole extent of Tientsin—there was at least 18 feet at low-water, without a single shoal or obstruction; but, just as the northern suburb is cleared, an extensive shallow commences, a mile in extent, having only 6 feet on it at low-water, and about 10 feet at high-water. Just above this flat, a fine canal is seen to the north-west, spanned by a handsome bridge; this canal, we were informed, communicated with the great city of "Pan-ching" or "Pan-ting." Vast numbers of river-craft were reported to have escaped up this artificial stream. In Macartney's map this canal is not marked, or perhaps it has been subsequently constructed, although of that I have strong doubts. The river beyond the canal, and just at the confluence of the When-ho, or Salt River, deepens suddenly to five fathoms, but does not long remain so, as the Peiho now commences to assume a totally different character to what it is below Tientsin. Artificial embankments exist on either side directly the mouth of the When-ho is passed, especially on the eastern hand, and, apart from shallows, the channel is very narrow, and turns rapidly from one side to the other. We soon found it necessary to abandon the *Bustard* gunboat for one of lighter draught, the *Kestrel*, Lieutenant Rason in command. Taking advantage of high-water, which only gave us from 6 to 7 feet in the deepest part of a long reach 3 miles above the When-ho, we pushed past several populous villages, the men and boys in which voluntarily turned out to track our boats, or drag at the gunboat's hawsers. The river was nowhere more than 100 yards broad, in many places not more than 200 feet, and the difficulties of the navigation increased apace as we advanced. Under these circumstances, the senior officer decided on not risking the grounding of the gunboat where she would not float off until the next spring tides; we therefore turned back in our reconnaissance when abreast of the village named, I believe, "Quam-yin," and about 9 to 10 miles beyond "Tientsin." At this point there was still a rise of tide of 2 feet 6 inches, and the flood was perceptible. The river was 200 feet broad, with a narrow channel, in which from 8 to 10 feet water existed for a width of 25 feet, equal to about that of a gunboat; the rest of the stream was very shoal. Three fine villages were in sight, the farthest, a brick-built one, of evident importance.

There was every appearance, in marks upon the river-bank, of the river being at times much higher than when we saw it, and, from all I heard, I feel little doubt that, in early spring during the thaws, and in autumn or summer rains, there would be no difficulty in one of our small-class gunboats, lightened to 4 feet, ascending *one-third* of the way up to Tung-chow, the landing-place for the city of Pekin, or about 20 miles above Tient-sin, leaving only 40 miles to be done with rowboats. A boatman of the Peiho, whom I interrogated through Mr. Lay, said that one-third of the way between Tientsin and Tung-chow, the river had deep water in it; that in the next third it was as deep as up to his waist, and the rest of the way it was only knee deep. It is true that, during the time the water in the Peiho is highest, the current would be strongest; still that would be no great obstacle with steam-power and an unlimited amount of manual labour at command. The country above Tientsin varied in no degree from that immediately below it. A splendid paved road exists between Tientsin and Pekin, and in dry weather the whole plain is passable for carriages, men, or horses. If, at any future time, military operations against Pekin be necessary, the months of April, May, and June would be the best to employ. The course of the Peiho should be followed to Tung-chow for facilities of transport, supplies, manual labour, and fresh-water; depôts should be there established, and the fall of Pekin would be assured with no great difficulty.

The only general remarks upon Chili that I have to add, are touching the climate. Nothing could have been more invigorating and delicious than the weather we experienced throughout April and May. Europeans could work in the sun with perfect impunity, and the nights were cold enough to wear blue clothing and to sleep under a blanket. During June the power of the sun increased very much, but the nights, particularly on shore, were still very refreshing. Two hot days were, in June, invariably followed by a tornado, generally coming from the north-west, which cooled the atmosphere amazingly.

Dry, hot winds from the desert of Kobi were occasionally experienced; they were not more trying than the siroccos of the Mediterranean, and, provided no violent exertion was called for during their continuance, which never exceeded more than twelve hours, no evil ensued.

The following are the maximum and minimum temperatures registered during 84 days off the Peiho River and in Tient-sin:—

				Maximum. ° Fahr.	Minimum. ° Fahr.
Thermometer	on board ship,	April	..	68	46
"	"	May	..	74	50
"	on shore	June	..	86	62
"	in the ship	July	..	98	73

During the same period of 84 days—that is, from the 14th April to the 14th July—the wind prevailed as follows:—

12 days the wind prevailed from North to East.
12 days " " North to West.
38 days " " South to East.
22 days " " South to West.

Just prior to quitting Tientsin the temperature rose to 96° during the day in the shade, and we thought it very hot; but when in a week subsequently we found ourselves gasping in the hot, steam-like atmosphere of the Yang-ze-kiang, all looked back with regret to the clear and bracing climate we had left behind us in Northern China.

At some future day I hope to be able to throw together some remarks upon the Gulf of Leotong and the Corea, but for the present I must draw this long paper to a close with every apology to the Fellows of the Royal Geographical Society for having so long detained them upon a subject of which possibly I may have overestimated the interest and importance.

TIDAL OBSERVATIONS made on board H.M.S. *Furious*, at the anchorage off the Peiho River, Gulf of Pecheli, Lat. 38° 55′ 18″ N., Long. 117° 54′ 30″ E., for the purpose of ascertaining the Rise and Fall on the Bar of that River, and High Water at Full and Change of the ☾.

Date.		Moon's Age from Nautical Almanack.	High Water.				Low Water.				Rise and Fall.		Winds.			Barometer and Thermometer.	
			Time.		Height.		Time.		Height.				Direction.	Force.	Weather.		
1858.			h.	m.	ft.	in.	h.	m.	ft.	in.	ft.	in.					°
April 15	A.M.	1·5	3	30	31	0	10	15	22	0	9	0	South to S.E.	4 to 5	b c	30·34	56
	P.M.		3	45	30	0	11	0	22	6	7	6	S.S.W. to S.S.E.	4 to 5	b q	30·12	58
April 16	A.M.	2·5	4	0	31	0	10	30	22	0	9	0	S.S.E. to W.S.W.	2 to 3	o c f	30·11	60
	P.M.		4	15	32	0	11	30	23	6	8	6	Calm, W. by S.	0 to 3	c m	30·06	60
April 17	A.M.	3·5	4	0	32	0	11	15	22	0	10	0	W.N.W., N.W.	1 to 6	b c	30·09	58
	P.M.		5	15	32	6	..		..		8	0	N. by W., E. by S.	2 to 6	b c q	29·95	62
April 18	A.M.	4·5	4	45	31	0	0	15	24	6	6	6	S.W., W. by N.	2 to 6	b c q	29·97	58
	P.M.		6	15	31	0	0	15	22	0	9	0	N.W., Northerly.	6 to 3	b c	29·97	62
April 19	A.M.	5·5	5	15	32	0	0	30	25	0	7	0	N.W., N.E.	4 to 1	b c	Not observed	
	P.M.		8	0	32	0	1	0	22	0	10	0	South, S.E.	2 to 6	b c q	29·87	60
April 20	A.M.	6·5	4	30	31	0	0	30	24	0	7	0	South-easterly.	5 to 1	b c	29·74	60
	P.M.	☽ at 10 P.M. S.T.	8	45	32	0	1	45	22	9	9	3	Easterly.	3 to 4	b c	29·82	60
April 21	A.M.	7·5	4	45	32	0	1	0	29	0	3	0	E.N.E., East.	5 to 3	b c	29·90	58
	P.M.		9	15	31	0	3	0	23	0	8	0	E.S.E. to E.N.E.	1 to 3	b c	29·87	60
April 22	A.M.	8·5	8	45	32	0	4	30	25	0	7	0	North-easterly.	3 to 4	c m	30·16	58
	P.M.		10	0	32	0	4	15	23	6	8	6	N.N.E.	4 to 6	b c	30·22	54
April 23	A.M.	9·5	9	30	29	6	3	45	26	0	3	6	N.E., N.N.W.	2 to 3	b c q	30·14	51
	P.M.		11	45	29	0	5	45	22	0	7	0	W.S.W., S.S.W.	2	b c	30·00	57
April 24	A.M.	10·5	..		..		6	15	23	0	6	0	N.W., E.N.E.	3 to 1	b c	30·10	60
	P.M.		0	15	29	0	7	30	22	0	7	0	S.E., S.S.E.	3 to 4	b c	29·81	61
April 25	A.M.	11·5	0	45	31	0	7	30	24	0	7	0	S.S.E.	2	b c	29·93	58
	P.M.		1	45	32	0	7	30	23	6	8	6	West, North.	1 to 4	c r	30·00	59
April 26	A.M.	12·5	2	0	32	4	9	30	24	0	8	4	Easterly, N.W.	1 to 4	b c q	29·95	57
	P.M.		2	0	31	6	9	0	24	0	7	6	N.N.W., N.W.	2 to 5	b c q	30·03	59
April 27	A.M.	13·5	2	0	31	0	9	15	22	0	9	0	N.W.	3 to 5	b c	29·95	57
	P.M.		2	15	30	0	9	0	23	6	6	6	N.W.	4 to 6	b c m q	29·97	59

TIDAL OBSERVATIONS made on board H.M.S. *Furious*—*Continued.*

Date.		Moon's Age from Nautical Almanack.	High Water.		Low Water.		Rise and Fall.	Winds.			Barometer and Thermometer.'	
			Time.	Height.	Time.	Height.		Direction.	Force.	Weather.		
1858.			h. m.	ft. in.	h. m.	ft. in.	ft. in.					°
April 28	A.M.	○ at 11 A.M. S. T.	1 45	30 0	9 45	22 6	7 6	N.W.	3 to 5	b o	30·07	56
	P.M.	14·5	3 15	30 6	..	..	..	N.W.	4 to 7	b c q	30·00	60
June 24	A.M.	12·9	..	..	8 30	22 6	..	Southerly.	1	b c	29·68	76
	P.M.		3 0	31 0	10 0	25 0	6 0	S.E., S.W.	2	b o	29·60	74
June 25	A.M.	13·9	2 30	30 0	8 0	23 0	7 0	S.W.	2	b o	29·62	74
	P.M.		4 15	31 6	10 0	28 0	3 0	S.E., N.E.	2 to 4	c p t	29·70	75
June 26	A.M.	14·9	2 30	31 0	9 30	23 0	8 0	East, N.W.	0 to 2	b c	29·82	74
	P.M.	○ at 5 P.M.	4 0	31 6	10 0	26 0	5 6	East, S.S.E.	1	b c	29·80	76
June 27	A.M.	15·9	3 0	31 0	10 30	23 0	8 0	E.S.E.	2	b c	29·75	75
	P.M.		5 0	31 0	11 30	25 0	6 0	South-easterly.	3	b c	29·80	75
June 28	A.M.	16·9	4 0	30 6	10 30	23 0	7 6	Northerly.	2 to 3	c q r	29·71	74
	P.M.		5 30	31 6	11 31	25 6	6 0	S.E.	3 to 1	c q r	29·60	72
June 29	A.M.	17·9	3 30	31 6	11 30	24 0	7 6	N.E.	3	o c p d	29·55	73
	P.M.		5 30	32 0	12 0	26 6	5 6	E.S.E.	1	o c r	29·43	74
June 30	A.M.	18·9	4 0	30 6	..	..	..	W.S.W., N.W.	2	b o	29·45	75
	P.M.											

REMARKS.—The High Water at Full and Change was at 4h. 8m. by our observations; the Russians made it a few minutes later. Difference between day and night tide 18 inches. The highest tide was on the second night tide after Full and Change, sometimes on the third night, according to the winds. Nine feet was the mean of the rise and fall at spring tides with a S.E. breeze; another foot of water was sometimes obtained. During dead neap-tides the tides were mainly affected by the winds, and on one occasion a fresh East wind caused as much water on the bar at dead-neap as on a spring tide! See Register April 20th, 1858. The flood tide comes from the S.S.E. The ebb tide comes from the N.N.W.

N.B. We made the High Water at Full and Change at 4h. 8m., and no difference between time of High Water at ship or bar. Horsburgh states High Water at Full and Change to be at 3h. 30m. The Admiralty Chart, No. 1391, of A.D. 1840, says 2h. 45m.

SHERARD OSBORN, *Captain* R.N.

Abstract of some Russian Tidal Observations made in H.I.M. Steamer *America* whilst at Anchor off the Peiho River.

Date.		Moon's Age.	High Water.		Low Water.		Rise and Fall.	Winds.		
			Time.	Height.	Time.	Height.		Direction.	Force.	Weather.
			h. m.	ft. in.	h. m.	ft. in.	ft. in.			
1857. August 1..	P.M.	. .	7 45	25 0	2 0	17 0	8 0	S.W.	Light	
August 2..	A.M.	. .	9 30	24 0	2 15	16 0	8 0	S.W., S.S.W.	Light	
	P.M.	. .	9 0	25 0	3 30	19 0	6 0	South.	Light	
August 7..	..	● at 5h. 41m. Greenwich Time.	4 0	24 0	9 0	15 6	8 6	N.W., S.S.W.	Light	
			4 0	25 0	..	..	9 6	S.S.W.		
August 8..	A.M.	. .	5 0	22 0	12 30	16 0	6 0	W.S.W.	Light	
	P.M.	. .	4 30	25 0	10 30	16 0	9 0	W. by S.	Light	

Remark.—☾ Last Quarter, July 31st, at 5h. 41·2m. Greenwich Time. ● New Moon, August 7th, at 4h. 25·7m. Greenwich Time.

N.B. The time of High Water at Full and Change agrees very nearly with that observed on board H.M.S. *Furious*.

SHERARD OSBORN, *Captain*.

Off the Peiho River, Gulf of Pecheli, lat. 38° 53′ 18″ N.; *long.* 117° 54′ 30″ E., *distant* 8 *or* 8½ *miles from the Forts at the entrance of the River, in* 22 *ft. at low water.*

From this position the land about the entrance of the river is just visible from a ship's deck in fine weather; and with a glass the forts (since destroyed) and a joss-house in the village are easily distinguished—the joss-house N. 68° W., and fort N. 60° W., true. The bottom is a mixture of sand and mud, and holds well; but a strong breeze causes a very disturbed sea, and no doubt the heavy winter gales would render a more sheltered spot desirable.

The river itself is barred by a shallow bank of sand, mud, and in some places small stones, extending completely across its mouth, and having at low water spring-tides no more than 2 feet over it in any part. The rise and fall at spring-tides is about 9 feet; therefore a vessel drawing 10 ft. 8 in. might safely cross the bar at the highest springs, and in July, under favourable circumstances as to wind, &c., 1 ft. more might accomplish it, as the south-west monsoon, when fairly set in, appears to increase the depth to that amount.

Strangers entering should examine the bar at low water, when the remains of old bamboo-beacons used by the Chinese junks will be seen, and serve as the best guides to the channel. By using these no difficulty will be experienced until the water begins to deepen, when the ripple on the banks on either side will be a safe guide right to the entrance.

The time of high-water in April, at full and change, was $4^h\ 8^m$, but in July $3^h\ 30^m$; and the highest tide generally happened on the second and third days after new or full moon.

The most water ever actually measured by me on the bar was 11 ft.; but from the Register of Tides kept on board the ship, allowing for the difference of depth, I find as much as 12 ft. in July. The tides near the entrance run very strong nearly across the course at the first of the bar, but more fairly in, when farther advanced, the flood running to the northward and ebb to the southward, changing with the change of tide. When once the rising has commenced, it continues very rapidly, and the slack is of very short duration. A vessel of 10 ft. draught should therefore be prepared to start at a full hour before high-water time, so as to ensure not missing the greatest depth, as the tide commences to fall fully an hour before it ceases running up between the forts.

Running from the Straits of Mia-Tao for the anchorage off the Peiho River, a W.N.W. course was found to carry several ships a considerable distance to the southward—so much so that they arrived steering N.N.W., and even N., to the anchorage. This I attribute to a constant southerly set; it was observed more particularly during the time of the north-east monsoon, and may possibly not exist at all times.

During the passage across from Mia-Tao soundings will be obtained the whole distance, and will give sufficient warning of the approach to land to prevent running into danger.

The Sha-lin-tien islands and banks were not examined by us; but the joss-house on the centre of the eastern island was seen, and being distinctly visible eight or ten miles off, would serve as a very good landfall to direct to the anchorage.

During the north-east monsoon a day seldom passes without a strong breeze; and although none were experienced during our stay sufficient to cause anxiety as to the ship's anchorage, great difficulty was experienced by boats in getting back to their ships: they should therefore always be provided for a day or two of absence.

These strong breezes come on sometimes very suddenly, and were not confined to any quarter, changing without warning from south-east to north-west, and blowing at a force of 7. After the month of May, or when the south-west monsoon had fairly set in, the weather became much more settled, sea-breezes, or those from east and south-east, setting in soon after noon, and continuing until the next morning.

Generally south-east, south-west, and westerly winds carry the lowest barometer, and north-west and northerly the highest.

Stephen Court, Master R.N.,
H. M. S. *Furious.*

The President, in proposing a vote of thanks to Captain Sherard Osborn, said: We always receive any "stray leaves" which come from our friend Captain Osborn with gratitude; and I am quite sure that he has never sent any communication to us, whether from the Arctic regions or the Sea of Azof, which has excited greater interest among the Fellows of the Geographical Society than this vivid and striking description of the bay and river which lead to the metropolis of China. There are, I know, persons present who are well capable of throwing additional light upon the subject.

Capt. W. H. Hall, R.N., F.R.G.S.—I may just mention that I was in the Gulf of Pechell, when a youngster, in the *Lyra*, and that I quite coincide with all that Capt. Sherard Osborn has said of that interesting part of China; in fact, I have been much gratified and edified in hearing such a good account of that part of China from one who has gone over the same ground as myself. I certainly did not go up the river; but as a midshipman, with Lord Amherst's embassy, I entered the mouth of the Peiho in a boat, and I was glad to find that the last expedition got up so much farther than we did, and that they did so much good service.

Mr. Wm. Lockhart, F.R.G.S.—With much pleasure I have heard the paper read from Captain Osborn, and I hope it will be the prelude to many papers of a similar kind regarding the north part of China, which has hitherto been an entirely unknown region. It is to be hoped, now that we are about to have large intercourse with the coast of China, that it will be one of the first efforts of our Government to institute an inquiry into the nature of that coast. We have no good charts, and there are no means of forwarding commercial enterprises beyond Shanghai. There are imperfect charts of some portions of the coast; and it is of great importance that the whole coast should be carefully investigated. As to the Gulf of Tartary—a very important region—we know little about it; for when our ships were there in 1856 there was little time or opportunity for extensive surveys to be made. It was with great pleasure I heard the remarks of Captain Osborn as to the increasing trade of Shanghai. It is astonishing that within fifteen or sixteen years so much should have been done in that place. When we went there in 1843 there was nothing on the banks of the river but a few mud-hovels and shipyards. Now it is an extensive and handsome city of palaces, along the edge of the river for about a mile or a mile and a half.

This place, with Fu-chow for black tea—Shanghai being for silk and green tea—and the large town Han-kow, up the Yang-ze-kiang, for the sale of European goods, will be the three important places for foreign trade in future. It is true we have access, or shall have access, in the next year to large portions of China, especially on the northern coast, which we have hitherto not visited. But the other ports in the north of China are of little commercial consequence compared with these three places. Fu-chow was at one time of little importance; but in consequence of the disturbances in the south of China, consequent upon the breaking out of the rebellion, immense quantities of black tea for exportation have been sent to that place. Shanghai, from the time of our British merchants going there, has ever been of growing importance. Captain Sherard Osborn's account of the silk trade there is quite within the limits. These two places, with the addition of Hankow, are the three important points of China for foreign trade. Canton may regain for some years much of its ancient renown as a place of trade, but it will never be the important place it was some years ago. Access to Tien-tsin and Pekin is of great political importance, but the new consular ports of Nunchang in Manchuria, Tang-chow in the province of Shantung, Swatow in Canton province, Kung-chow in Hainan, and Taewin-fu in Formosa, will probably never have any very great and important trade. There may be one or two ships go to them occasionally, but the three places I have named —Shanghai, Fu-chow, and Han-kow—will be the great points of export from China. Han-kow has not been visited by Captain Osborn, nor by any foreigner; but when we get more intercourse with China, it will, I think, be a most important place. The reason we suppose it to be so important is, from the accounts we receive from the native merchants, who we know resort there in large numbers.

One other point that I may allude to is the northern mouth of the Yellow River. I am glad to hear Captain Osborn bear witness to the truth of some remarks that I made upon this point last session to the Society. It is interesting to find that other observers going to that region have noticed this extraordinary change in the course of the Yellow River—that, instead of flowing into the Yellow Sea, it goes to the north of the Shangtung promontory, and falls into the Gulf of Pecheli. As I said before, it is one of the most extraordinary changes that have ever taken place in modern days in so large a river. It is astonishing that so extensive a stream should be diverted from its course, and pass two hundred miles to the northward. I think the Chinese will have to incur great expense in building up the banks of the Yellow River, for it cannot possibly remain in its present state without great loss to the country. It is not merely that the stream is diverted, but the consequence is, that much of the level ground of the provinces of Chi-li and Shantung is under water at the present time, forming an extensive marsh, and is thrown out of cultivation. This loss of arable land has been a great loss to the whole of that district. The district is hilly, and the Yellow River having broken over the plains, the inhabitants have very little ground left to cultivate. When the present rebellion is put down, one of the first things that the Chinese will have to carry out will be a series of engineering works on the banks of this river, so as to compel it to return to its former course. It cannot be allowed to fill up the Gulf of Pecheli with its deposits. That gulf being the road to Pekin, the Chinese themselves will be very anxious to keep it open; and certainly if the Yellow River continue to flow into the Gulf, it will shoal it up, and make it a broad plain. That will be very undesirable for the welfare and prosperity of Pekin, which depends essentially upon the river for the whole of its rice, which is brought from the south of China to the north. The voyage from Shanghai to the mouth of the Peiho is made by sea-going junks; and in consequence of the Grand Canal being stopped up by the rebels, the Chinese have had to send large quantities of grain by sea. They consider this very undesirable; and no doubt as soon as possible they will reinstate the passage of the Grand Canal, which has been blocked up in many places, and so prevented the rice-junks from going along its channel for the last five or six years. These two circumstances have greatly interfered with the prosperity of northern China, and the people have been greatly reduced in their circumstances in consequence of the high price of grain. It is true, as Captain Osborn remarks, that immense quantities are shipped to the north every year, but the expense of carriage, either by canal as formerly, or by sea as at the present time, is so great that, instead of costing two dollars, as at Shanghai, a picul—which is 133 lbs.—it costs from ten to fifteen at Pekin. By and by probably great use will be made of *foreign* ships in carrying this rice to Pekin as soon as peace is thoroughly restored. I am very glad to have heard from Captain Osborn that he has ascertained something more about the northern branch of the Yellow River than we previously knew. I hope in the course of a little time, as our ships and men-of-war are enabled to survey the coast, that we may gain some exact information as to the point where the mouth of the Yellow River exists. At present we do not know where it falls into the sea, beyond the mere fact that its present or northern mouth is somewhere between the outlet of the Pei-ho and the promontory of Shantung.

The President.—The Society has doubtless heard with much satisfaction, from a person so well acquainted with the resources of China as Mr. Lockhart, so clear an explanation of what we may expect as the result of our treaty of commerce with the Chinese. Engineers will really have stout work if such an operation is to be attempted as the restoration of the ancient course of the Yellow River, which, owing to the neglect of the government, has broken its bounds and changed its course by flowing to the north.

In summing up what had been brought forward respecting China, the President stated that, if time had permitted, some very valuable extracts from the MSS. of the late Captain Parish, R.A., who had accompanied Lord Macartney's celebrated expedition to Pekin, would have been read. Sir Woodbine Parish had thoughtfully forwarded these documents of his relative, including illustrative sketches, of which Sir G. Staunton had made great use in his well-known work.

The Second Paper read was—

2. *On the Search for Leichhardt, and the Australian Desert.* By the Rev. W. B. Clarke, of Sydney, M.A., F.R.G.S.

The last letter from Leichhardt was dated "Mount Abundance, April 4th, 1848." Since then two expeditions have found traces which are considered to have referred to him. The one expedition was that of Mr. Hely in 1852, and the other that of Mr. Gregory in 1858.

Mr. Hely found two camps 150 miles from Mount Abundance, each of them marked with the cypher XV. A., enclosed within a rude border of bent lines that bore some resemblance to a letter L., and which he interprets as indicating "Leichhardt, April 15." He also heard from the natives of the neighbourhood that Leichhardt was murdered at that very place.

Mr. Gregory found remains that he concluded to be those of Leichhardt 80 to 100 miles farther towards the interior than Hely's camps, and, as such, to refute the report of his previous death at the latter place. The remains consisted of an L cut upon a tree by a camp; of the marks of sharp axes; of some saplings that had been cut with them; and of two horses running wild.

The object of Mr. Clarke is to show that neither the discoveries of Mr. Hely nor those of Mr. Gregory have any reference to the camps or fate of Leichhardt.

In the first place, he argues that Leichhardt could not have reached Hely camp on the 15th of August. The rate of his previous journeyings, and that of other travellers in the same country, as Mitchell, Kennedy, and even Gregory, make it highly improbable that 150 miles of direct distance could have been accomplished by him in 11 days.

Again, the country north-east of Mount Abundance had been visited as far back as 1847, by many persons on the look out for cattle runs, and the trees were known to bear marks of an M and also of an H, and Leichhardt himself speaks of having found an L on the Balonne. The axe marks are to be accounted for by the fact of Kennedy having given axes to the natives thereabouts; and, if the saplings had not been cut by Kennedy himself, it is to be remembered that, according to Mitchell, the natives of those parts use saplings for the construction of their own huts. The loose horses found by Gregory in Cooper Creek are ascribed by Mr. Clarke to Captain Sturt's expedition. That explorer relates that he turned out a roan horse that was unfit for further work "in pity" at this very spot, and also that, 145 miles farther on, another horse stole away from his party (as the same animal had often done before), and Mr. Clarke thinks it must have tracked its way back to the excellent pasturage where its roan companion had been left behind.*

Mr. Clarke considers it questionable whether Leichhardt went to the Victoria at all. His method of travelling, which was cautious, slow, and persevering, makes it likely enough that when he actually came to the frightful desert he would have skirted it, looking out for an opening, rather than have attempted to cross it at once. Mr. Clarke concludes that it is somewhere between the head of the Victoria and the head of the Clarke that Leichhardt's tracks are to be looked for, not probably on Mitchell's route, but to the westward of it, or else that, driven in by drought, Leichhardt may have taken a course on the 148th meridian, without crossing the Maranoa.

CAPTAIN BYRON DRURY, R.N., F.R.G.S.—Upon this subject perhaps I may be permitted to say that I happened to be present when we took possession of the whole of that part of the coast of North Australia. We found it was one of the finest districts in Australia; and I must say that I think Port Essington, with the exception of Port Jackson, the finest harbour in Australia. I was there during eighteen months, and we never had the slightest disease or illness in our two ships' companies. I have heard that port cried down, I am sorry to say, by my late friend Captain Stanley and others; but from what I have seen of it, I perfectly agree with the late Sir Gordon Bremer, that there is not a place on the north coast of Australia better adapted for Europeans, in addition to the advantage of possessing a perfect harbour, with a peninsula, the neck of which is only eight miles in width. Why we have not retained possession of that coast is to me extraordinary. I entirely agree with my friend Sir Charles Nicholson about Cape York; and, putting the Gulf of Carpentaria on one side, I must say I think Port Essington the best site along the whole coast. It is well watered for Australia. Had we not been there in 1838 two French frigates would probably have taken possession of it. They arrived two months after us. We held it for twelve years, and then abandoned it. The proved advantage of Cape York as a place of refuge for the frequent wrecks among the Barrier Reefs and Torres Straits is, among other considerations, of great importance.

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* What were the colours of the horses seen by Mr. Gregory?—F. G.

Rear-Admiral FitzRoy, F.R.G.S.—May I venture to remark that this seems to be one of those great questions that might fairly be taken up by the Government. I apprehend that the exploration of Australia has never yet been undertaken in a thoroughly efficient manner. There has been the utmost daring, energy, perseverance, and good management on the part of those engaged, but the undertakings have been in detail rather than comprehensive, and by comparatively private expeditions.

How strange it would appear to an Arabian or an African if we were to ask him to undertake an excursion across the vast deserts of Africa with ponies or horses, or even bullocks! How is it that we have never taken the camel—"the ship of the desert"—from those countries where it is indigenous, and transported it to those of our colonies which are in such want of it? We have in Australia an enormous extent of country which in all probability is a comparative desert. There may be steppes, there may be a great inland sea—perhaps fresh, perhaps salt—who can say with certainty? The probability is that there are no very high ranges of mountains, and no very great rivers, but a great extent of barren and unfertile country, with perhaps an extent of inland water. No desert has yet been found in any part of the world in which there is not an oasis. There may be such a space in the interior of Australia—not only a fertile and valuable district, but one in which there may be tribes who have never yet seen the white man. When we consider that we have hundreds of thousands of our countrymen spread round the borders of that continent (for such it is), surely it is worth urging the Government to undertake an expedition into the interior upon a scale worthy of this great country.

It may be naturally asked, how should it be done? One very simple course occurs to me—somewhat military it may be—that of first establishing a base of operations as far within the country as one can yet go with security, and making there a temporary settlement, perhaps for two or three years; and then from that basis working inwards.

One expedition might be set on foot from the eastern coast, another from the south, another from the west, and another from the north—all carried out under Government, by experienced colonists, with such aids as I have alluded to, particularly the *camel*—emphatically, I repeat, "the ship of the desert." Apologising for this interruption, I conclude by earnestly pressing for the introduction of the camel to Australia.

Lord A. Churchill, F.R.G.S.—I would venture to make one or two observations with regard to the great importance which would result to this country, and to the whole of the Australian continent, from the formation of a succession of settlements on the north-east coast. I believe the region in question would be found very favourable for the production of the cotton-plant. I am told it has been known to flourish there, and can be produced in sufficient quantities to supply the English market, and from its peculiar nature likely to bear a high value. It must, therefore, be a matter of the highest concern to this country to be enabled by means of these settlements to secure the production of cotton for ourselves, and thus in some measure render us independent of the United States. There are other articles natural to a tropical climate which might be cultivated to great advantage in these provinces; and the climate moreover is well adapted to European constitutions. Therefore I think it is a question which ought to be taken up by the Imperial Government.

Dr. Hodgkin, F.R.G.S.—I do not expect to add anything to the interesting remarks made by gentlemen who have been upon the spot, but I cannot allow the opportunity to pass without calling attention to one point. I have been informed by a friend, who spent some time on the northern coast of Australia, in the vicinity of Cape York, that many wrecks occur in that neighbourhood; and his statements have been corroborated this evening by Captain Drury. Considering the number and value of the shipping in that sea, independently of the productions to be obtained from the land, it must be highly important to take advantage of the natural harbours to be found on that part of the coast, where vessels and their crews might be saved in case of injury or distress.

Mr. J. Crawfurd, F.R.G.S.—I believe I can with confidence assert, that the alleged fertility at Cape York, or at any place in its neighbourhood, is an impossibility—for this reason: there is no range of mountains, and hence no fall of rain, and consequently no adequate means of irrigation. Irrigation, or an abundant supply of water within ten or twelve degrees of the equator, is indispensable to fertility: the most fertile land is unproductive without water, and water for perennial irrigation does not exist about Cape York. Horned cattle may be reared on the shores of the Gulf of Carpentaria, but there is no market for them. Sheep could not thrive there, and they would produce hair, or something like it, instead of wool, and that would be unsaleable. Besides, where are the labourers to cultivate the soil? No European constitution could stand the heat so near the equator; and as to the Chinese, they have too much good sense to go there as long as they can get to the gold-fields. As to Port Essington, that was abandoned eight or nine years ago on account of its insalubrity. The harbour may be good, but the climate is so unhealthy that no European could live there; and such being the result of long experience, the settlement was abandoned by the Government.

Captain Byron Drury.—I do not know where Mr. Crawfurd obtained his information, but I lived at Port Essington eighteen months, and I can say that we grew every tropical production in the greatest luxuriance. We had ponds of water about there; and during an excursion of ten days into the interior we found water wherever we went. I do not mean to say that water is as abundant as in New Zealand, but we found continuous streams; and as to fertility, we raised enough to supply us in two months after we arrived there. I will give another instance of the productiveness of the country. When Sir Stamford Raffles left this settlement, Captain Barker turned out some cattle. In 1838, when we went there, and a party of us penetrated thirty miles into the country, we found a quantity of oxen wallowing in swamps; and now there are wild horses. How could they live without water?—and yet there they were living and prospering, especially the cattle.

Mr. Trelawny Saunders.—I think the best answer to Mr. Crawfurd is the statement of Flinders, who, when he explored the Gulf of Carpentaria, expressed his surprise at finding an abundance of surface water at the end of the dry season. Leichhardt also stated that during his long journey around the Gulf, his cattle, far from being generally in want of water or vegetation, fattened as they went along the road. A recent traveller has told us that the country presented a dismal appearance, covered as it was with long dry grass, burnt here and there by the natives. The gentleman must have forgotten that the dried grass was once green, and that its growth had been fostered in the proper season by sufficient moisture. Against the evidence of Flinders, Leichhardt, and Stokes, I think Mr. Crawfurd's opinions must give way. I went away from a former meeting grieved to think that Mr. Gregory's report would tend to hinder the settlement of Northern Australia. This paper of Mr. Clarke's has revived my hopes as to the early colonisation of the country round the Gulf of Carpentaria. Let it be recollected that the two expeditions sent out to connect the northernmost bend of the Barcu River with the bottom of the Gulf of Carpentaria failed, not from the difficulties of the country, but from the failure of provisions; for Sir Thomas Mitchell describes the country to the northward of the Barcu as the finest he had seen in the whole of Australia.

The President.—The discussion has somewhat diverged from the point at which we started—the expedition in search of the remains of Leichhardt. I rejoice, however, that it has taken this turn, because it has brought forward my friend Mr. Crawfurd, who, upon certain subjects connected with North Australia, may be called our "objector-general." His objections are indeed always of great use, and on this occasion they have elicited from gentlemen who have lived upon the spot, that this very region, which my friend stigmatises as unfertile, and not fitted for the maintenance of sheep and the growth of wool, is in the highest degree productive, well-watered, and adapted for the sustenance of sheep as well as cattle. I regret that Sir John Pakington, one of Her Majesty's Ministers most interested in this discussion, so far as it regards the establishment of a great naval depôt in the northern part of Australia, should have left the room just as we were beginning to debate that point. To me indeed it is not a new subject. In the years 1844 and 1845, when I was your President, I argued earnestly for the establishment of a great naval entrepôt upon that coast; and I supported with all the energy in my power the enlightened views of Admiral Sir Gordon Bremer, a most experienced navigator in those seas. I have long thought that Great Britain ought not to hold three sides of the great continent of Australia without having on its northern frontier any one settlement. Provided only a port be established, it is unimportant to me whether it be at Cape York or Port Essington; though, if I were consulted, I should like to see a settlement established also in Cambridge Gulf, which is well watered by the Victoria River, navigable for some distance, where our men were encamped for eight months, enjoying perfect health, and where the wool of the sheep did not deteriorate; these animals having been pastured up to their knees in grass. Judging from the experience of Gregory's expedition, I feel certain that Englishmen could live there to their own advantage, as well as to that of the mother country. I rejoice indeed that gentlemen who have resided in Australia are ready to enforce the necessity of establishing some great entrepôts, particularly as ports of refuge, to provide against the possibility of these seas being swept by a hostile fleet; for with the knowledge that the French have now occupied and settled New Caledonia, with its splendid natural bays and harbours, which were discovered and named by our own Cook, it is absolutely essential that we should be better prepared.

Third Meeting, December 13th, 1858.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Earl Stanhope, the Rev. N. Lewis, and Messrs. J. A. Rucker, G. M. M. Esmeade, and Conway M. Shipley, were presented upon their election.*

ELECTIONS.—*Colonel J. A. Hazelius, Chief of the Topographical Corps of Sweden, as a Corresponding Member; Capt. C. Cornwallis Chesney,* R.E.; *Captain F. Monckton Jones; Rev. William J. Edge,* M.A.; *James Allan; Henry Blackett; Henry Collinson; William Davies; Pascoe St. Leger Grenfell; Charles Lewell, Phil. Dr.; Francis Lyne; A. Henderson MacDougall; J. Sydney Stopford; and J. J. W. Watson, Esqrs., were elected Fellows.*

The Papers read were:—

1. *Notes on the River Amúr and the adjacent Districts.* By MM. PESCHUROF, VASILIEF, RADDE, USOLTZOF, PARGACHEFSKI, &c.

THE Paper read before the Society consists of a large collection of extracts from a series of reports made to the Imperial Geographical Society of Russia. They were written by the leaders of the various expeditions which had been despatched to explore the Valley of the Amúr, its tributaries, and adjacent districts.

It will be recollected that the Amúr is the most valuable river of Northern Asia, and the only one that connects its central steppes with the rest of the world. It is navigable, with trifling interruptions, from the Pacific, by the Sea of Okotsk, to the very foot of the Yablonnoi range, and it appears that a very small amount of road and canal would suffice to open a communication between that point and the Baltic by way of the Selenga River and Lake Baikal. A certain amount of commerce is already being carried on upon the waters of the Amúr. American products and manufactures find their way to Irkutsk, and salted meat from the trans-Baikal provinces is exported in exchange. Russian immigrants are beginning to settle along its banks among the ten tribes (some partly settled, others entirely nomad) that have hitherto occupied the soil. Taking, as a whole, the accounts of the various travellers whose communications have been incorporated into the present paper, it would appear that the Amúr is within—but only just within—a climate admitting of agricultural fertility and pastoral wealth. The summer is fine, but winter is extremely rigorous, and the natural vegetation of the land consists alone of the hardiest plants. Farther to the north the climate becomes rapidly more unendurable; but, on the other hand, a genial climate and a new flora are soon reached on travelling to the southward.*

Captain R. Collinson, F.R.G.S.—I have not visited the country watered by the Amúr, and therefore I approach the subject with some degree of trepidation, for I always like to see a thing before I speak about it. But as you have called me up, I must say that I have perused with a great deal of pleasure the papers which have been intrusted to me by the Council for publication in the Transactions of the Society, and I cannot help expressing my admiration of the able manner in which this exploration of a hitherto unknown country has been carried out. We may feel some national jealousy at the acquisition of so large a territory by a power which is already so predominant in Europe and Asia, but as geographers, in our special capacity, we must rejoice that this territory is now open to civilised occupation. From what I have read, and from what I have seen, it offers an admirable position for those who wish to colonise: it has everything that is required for the making of a great country. I also may say that although a stern winter visits it, yet it has undoubted capabilities for the production of corn, the great staple of our maintenance, and the vine which rejoices us; so that I think the country will prove a most valuable acquisition to the world in general. And although it has not fallen to our province to administer the functions of government in it, yet I cannot but think that this highway being opened into Central Asia will afford a great opening to British commerce.

The President.—This subject is so peculiarly interesting to Russia as well as to ourselves, that my distinguished friend his Excellency Baron Brunnow would have been here had he not been prevented by illness. That circumstance alone may be taken as the expression of a wish on the part of Russia to co-operate with the interests of British commerce. Without inflicting on you, gentlemen, any more observations of my own, I will refer those of you who wish to know more of my sentiments on the Amúr question, to the 2nd volume, page 277, of our Proceedings, where, in my last "Annual Address," I endeavoured to bring to your notice the great importance of this noble river.

The second Paper read was:—

2. *Explorations in Ecuador in* 1856-7. By Mr. G. J. Pritchett.

Communicated by W. Bollaert, Esq., F.R.G.S.

The interest lately excited towards Ecuador by the adjudication of 4½ millions of acres of its land to satisfy the claims of foreign creditors makes any information about this country the more acceptable.

The limits of the republic were not accurately defined at the time of the separation of Old Columbia into the three republics of Ecuador, New Granada, and Venezuela; and, again, the frontier on the side of Brazil and Peru is at the present moment under dispute.

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* *See* also Proceedings of the Royal Geographical Society, vol. ii. p. 153.—Ed.

Ecuador is intersected by the Andes, and, therefore, its centre division being on a high level, has a comparatively temperate climate, and is the seat of the principal towns; while the low east and west divisions are covered almost entirely by luxuriant forest, a small part indeed of which has been rescued from the dominion of the monkey and the wild boar. Guayaquil is the principal port of Ecuador. The route from it to Quito lies for the first 50 or 60 miles up a river whose mouth is 60 miles from Guayaquil. On leaving the river at Bodegas the arrangements for land traffic are so miserable that goods are occasionally detained twelve months in that town for want of means of transport. The route from Bodegas to Quito passes the Andes near Chimborazo, rising by a series of lower ridges through a beautiful variety of scenery, but the risks and difficulties of commercial traffic along it are enormous. Quito has some fine buildings, as a cathedral, churches, convents, and colonnades, all of the 16th century, and there are noble views of the snow-topped Andes from the high ground above the city.

As the road from Guayaquil is so circuitous and beset by natural difficulties, Mr. Pritchett started to explore another straight down to the sea-coast, and went by the side of the Mira River, through uncleared forest, and ultimately by canoes along the Cachabi River, to the port of La Tola, in the immediate neighbourhood of the Pailon. This port has been surveyed and reported on very favourably, and a road to it was actually commenced many years ago, but afterwards was neglected and allowed to become overgrown.

Mr. Pritchett returned to Quito by another route, and thence made a trip to the Bark country between the province of Cuenca and the River Amazon. Lastly, he went from Quito to Canelos by the north side of the Pastaza River, a tributary of the Amazon, which is navigable for 300-ton steamers to within 150 miles of Quito, so that capital may be said to be more accessible on the Atlantic side than by way of the Pacific. Mr. Pritchett here met Mr. Spruce, an English botanist, and records his notes upon the climate, &c., of Canelos. He described the wet and dry seasons as fused together: thus there is rarely a day all the year round on the upper Rio Negro without both sunshine and rain. The climate is remarkably healthy; he asserted that one may travel all day soaked with rain, and sleep at night on the damp ground with little protection without suffering from the exposure. There are traces of gold everywhere on the lower slopes of the Andes towards the east, and the mountain Llanganate is especially mentioned as worthy of exploration. There are many traditions of its wealth.

At present there is a monthly line of Brasilian steamers on the

Amazon to Nauta, a place within the limits of Ecuador; and Mr. Pritchett adds, it would be well were it generally known how little a settler in so mild a climate has to go through before he is in possession of all the requisites of a comfortable home. Mr. Pritchett lays much stress on the cotton-producing capabilities of Ecuador, and thinks that this torpid and roadless country, so little known and almost wholly neglected, is fully as capable of a prosperous development as any other on the Pacific shore of South America.

Mr. C. R. Markham, F.R.G.S.—It appears to me that the most important fact which is mentioned in this paper is with reference to the position of the city of Quito; that it is more accessible from the Atlantic, though distant 3000 miles, than it is from the Pacific, which is only about 90 miles from it in a direct line. The extraordinary productions of the forests of Ecuador—the gums, resins, wax, sarsaparilla, bark, cotton, cocoa, and numerous other valuable products—may be brought to the Atlantic, by means of the Amazon, with the greatest possible ease. These products are now lying waste in the forests, though so close to the Pacific; whereas if steamers, which are now navigating the Amazon from its mouth to Nauta in Peru, were allowed to go up the Pastaza or Napo to Ecuador, they might bring all these products down to the Atlantic. I scarcely agree with Mr. Pritchett that Ecuador has more resources than Peru. I believe that Peru has ten times as many resources as Ecuador in every way, especially in its mineral productions, all of which might also be brought down by these rivers. It has abundant supplies of copper and silver; and, above all, the alpaca wool, which is grown on the *punas* of the Andes, quite within reach of rivers navigable by steamers to the Atlantic. Nauta, which Mr. Pritchett mentions as being in the republic of Ecuador, is actually in the republic of Peru. Ecuadorians claim it, but possession is said to be nine points of the law, and it is actually in the possession of Peru. I know the governor of Nauta, and I hear that there is a war threatened between Ecuador and Peru about this very boundary. I trust that the two governments may act amicably, and that both states will combine to waft their products to the Atlantic by means of that magnificent river—the Amazon.

Mr. G. J. Pritchett.—The gentleman who has just spoken has alluded with some surprise to the comparison made between the resources of Ecuador and those of Peru, and expressed doubts as to the possibility of the products of the eastern slopes of the Cordillera of those countries being conveyed with greater facility to the Atlantic, a distance of 3000 miles, than to the Pacific, which is less than 100. As the experiment has already been made by a line of Brazilian steamers on the river Amazon, which carry produce from these provinces, and whether in the upward or downward passage are always full, it may be inferred that the facilities referred to already exist. These steamers were expected, when first established by the Brazilian government, to be an annual expense to the country, but experience has shown that a source of revenue has been acquired, and a great benefit to the nation obtained. As Peru gained its independence several years before Ecuador, and has had the advantage of much more intercourse with foreigners, it is not surprising that it is much more known and developed. It has benefited immensely also by the effect that its different mining districts have had in the formation of roads. Its mines have also been most extensively worked both before and after the independence. All these things have forwarded and assisted in the development of its resources. Yet enough has been discovered of Ecuador, in spite of the great difficulties attending research and exploration, to induce the inference that it is a country of surprising wealth as regards the products of its forests. Cocoa, coffee, cotton, cinnamon, ishpingo, ginger, gums, resins, bark, sarsaparilla, vanilla, and indigo, are all indigenous. The timber of large size, and suitable for all sorts of useful purposes, may be brought to market both from the eastern and western slopes. With these advantages, all that seems required to consummate the progress and ultimate civilization of Ecuador are good ports for the shipment of her products. Guayaquil is her present and principal port; there is another farther north, which has been surveyed by Captain Kellett, called the *Pailon*, or Cauldron of Saint Peter (San Pedro). On account of the want of a good road, it has never been used; but from its perfect suitability, and greater proximity to the capital, the Pailon will probably in a few years be the focus of Ecuadorian commerce.

Before I sit down it should be mentioned, that although during the Spanish rule no mines were worked in this country, yet it may be relied on that Canelos, the Napo, and Macas (on the eastern slope of the Cordillera), are not only extensive, but most valuable gold fields. Very fine specimens of ruby silver have been met with, and also in its native state.

Mr. J. Gerstenberg.—The gentleman who doubts the practicability of making the navigation of the Amazon available, because it would necessitate transporting the products of Ecuador a distance of three thousand miles, forgets that the question depends upon the cost of conveyance. Three thousand miles of navigation may be in itself inexpensive, whilst the short route by land to the Pacific, recommended by the gentleman, runs over the stupendous mountain ridges of the Andes, presenting insuperable physical difficulties, besides an enormous expense. Should a proper road be constructed for travellers, it may admit of the conveyance of the precious metals, and such other valuable and light articles in respect of which cheapness of transport is less important than expedition.* The gentleman has mentioned that Nauta at present belongs to Peru. It is in its possession, it is true. That gentleman says possession is nine points of the law, but it appears at the present moment that Peru claims an immense tract of land northward and westward, even to Papallacta, almost within sight of the city of Quito. If, then, nine points of the law consist in possession, it follows that this tract, which is in possession of Ecuador, belongs to Ecuador. The parts selected for the English bondholders by Mr. Pritchett were in possession of Ecuador at the time. Wherever he travelled he found Ecuadorian authorities, showing that he was within the territory of Ecuador. It is only justice to Mr. Pritchett to state that this is the case, because he has been accused of obtaining for the British creditors lands which were notoriously disputed, whereas he had no means of judging that Peru was going to dispute them. The claim of Peru was based on an edict of the King of Spain in 1802, which gave the jurisdiction over these territories to the Bishop of Lima. The eminent historian Prescott tells us, that the King of Spain used to let his pen fall on the map of South America, and divide it into provinces in that fashion, without the slightest understanding or knowledge of the country; but so impossible was it found to extend even the clerical jurisdiction of this bishopric over such distant regions, that the scheme was never carried out. The King of Spain has long ceased to reign in these districts, and many treaties have been concluded since, cancelling his preposterous territorial arrangements. Whatever map I have consulted has shown me that the frontier line of Ecuador and Peru was the Amazon, and in most maps it is given even below that river. But the hamlet of Zamora, the most southern point of the lands granted by Ecuador, is still considerably north of the Amazon. The claim of land on the part of Peru appears to be a mere pretext for the purpose of making war upon a peaceful neighbour. The Peruvian president and generals seem to be animated by the lust of rapine and conquest, like the first adventurous and unscrupulous cavaliers—the Pizarros, the Almagros, and the Alvarados. The real causes are said to be the secret instigation and lavish promises of the Ecuadorian ex-president Flores, who has been ignominiously expelled as a traitor, and also the allurement of a rich booty in the now wealthy city of Guayaquil. By the last advices it appears that two steamers of war have appeared before that peaceful and prosperous commercial port, threatening to bombard and burn it unless the frontier dictated by Peru, and some other humiliating conditions, were acceded to. In former centuries the reckless and turbulent captains appealed in their civil conflicts to the King of Spain, but now, his jurisdiction having ceased, there is that more powerful tribunal of public opinion, before which both the contending parties seem anxious to appear to be in the right. But, although from their rash conduct both parties may not be free from all fault, Ecuador deserves our sympathy, not only as the weaker party, wantonly attacked by a stronger neighbour, but also from the circumstance that her loyal conduct towards her British creditors has been made the pretext to involve her in this present difficulty. I consider this a geographical question, on which you may by your impartial opinion exercise a powerful moral influence. It is not merely the object of this Society, I believe, to acquire and promote abstract geographical knowledge, but it is your noble task to make practical application thereof for the progress of civilisation and the welfare of mankind; and certainly there does not exist a more noble task for any Society, and particularly the Geographical, than to maintain and promote the blessings of peace, and to avert the hand of wanton and fratricidal war.

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* Mr. Gerstenberg has evidently misunderstood the tenor of Mr. Markham's remarks.—Ed.

Mr. Markham.—The town of Nauta is on the south bank of the Amazon: therefore, according to the last speaker's own account, it does belong to Peru. I should think that legally and properly the true boundary between Ecuador and Peru would be the line which formerly divided the Viceroyalty of Peru from the jurisdiction of the Audiencia of Quito, and that would certainly give Peru both banks of the river. However, I think that the most just boundary would be the line of the Amazon, and that would bring Nauta within the territory of Peru.

Mr. E. Haslewood.—I believe the real point at issue between Ecuador and Peru is the possession of the head waters of the Amazon. The object to be attained by Peru is to close the Amazon against the trade of the world, at the instigation of Brazil, and to limit it to Brazilian and Peruvian ships. If Ecuador, as an effluvial state, has any claim to that river, she has an undoubted right that all vessels should pass up into her ports. If, therefore, Peru, and still more Brazil, can gain their object of depriving Ecuador of those lands, they can seal the Amazon, and they mean to do it. It is of the highest importance to the world at large that the Amazon should be considered as one long port, and that the navigation shall not be restricted to Peruvian or Brazilian vessels. It has been my lot to reside three years in Brazil, and a more idle, stupid people on all subjects of political economy does not exist. It has been my good fate to reside a short time in the United States, and I say that the Anglo-Saxon state of New York is worth to us the entire length and breadth of the whole of Brazil. Now, I most respectfully request a little information. Can you tell us what are the rights of effluvial states? Have they the power to close these mighty rivers? for you may rely upon it that if Brazil and Peru succeed in shutting out Ecuador, they will succeed in shutting out England.

The President.—I am happy to find we have had a discussion of a character which has thrown light on the advantages to British commerce, and on the necessity of maintaining the integrity of the republic of Ecuador. But I must avow that our debate has become rather more political than what we have been accustomed to in this room. It has deviated somewhat from our usual geographical discussions, yet not without profit to the community and satisfaction to myself. So that whilst the Geographical Society should not step beyond its own lines, we are at the same time happy to give fair play to a discussion of the political bearings of questions which our science brings into public notice.

ERRATA.

Page 113, line 8 from foot, *for* at least 22,500 *read* about 20,000.

Page 114, line 1, *for* assigned, they must subside from 22,500 feet to the low altitude of this, the leading coast range. *read* assigned to them, they must subside from 20,000 feet to the low altitude of this, the leading coast range, of which they form a part.

„ line 9, *for* The ridge *read* The coast ridge.

Page 116, line 8 from foot, *for* 22,500 *read* 20,000.

„ line 3 from foot, *for* The height of loftier *read* The exact height of the loftier.

PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

SESSION 1858–9.

Fourth Meeting, January 10th, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Francis Lyne and Charles Lewell, Esqrs., were presented upon their election.*

ELECTIONS.—*Rev. William G. Clarke,* M.A.; *Commander R. Boynton Creyke,* R.N.; *Lieut. Henry Lamb,* I.N.; *Sir H. Pollard Willoughby, Bart.,* M.P.; *Thomas H. Alsager,* B.A.; *and Edward H. Bramah, James Brand, William Brown, F. Selly Gosling, Valentine Labrow, Donald Larnach, Patrick Leslie, W. Drury Lowe, John Miland, Marc H. Pasteur, and Charles Ratcliffe, Esqrs., were elected Fellows.*

EXHIBITIONS.—Photographic and other views of the Termini and the proposed Route for the Honduras Inter-Oceanic Railway: and specimens of silver and copper ore, &c., brought from Mexico by Charles Sevin, Esq., F.R.G.S., were exhibited to the meeting.

The Papers read were:—

1. *Notes on the Zambesi Expedition.* From the Journal of THOMAS BAINES, Esq., F.R.G.S., Artist to the Expedition.

Communicated by DR. LIVINGSTONE, F.R.G.S.

With Maps by MR. SKENE, R.N., and MR. THORNTON.

The PRESIDENT read portions of a letter from Dr. Livingstone, in which he described how he had navigated the lower portion of the Zambesi, the good quality of the coal which had been obtained on its banks, the affectionate reception he had met with from his old native adherents, the cordial assistance of the Portuguese authorities, and the steady and vigorous support of the different officers of his Expedition, specially mentioning Mr. Thornton for having constructed a good chart of a portion of the river.

He also noted a peculiarity in this river, that where the ripple on the surface was most intense, there the water was deepest.

MR. BAINES's journal extends from June 25 to September 17, 1858, and the following is a short abstract of its contents:—*June* 25. The last of the luggage was taken from the *Pearl*, put into the launch, and the iron house on Expedition Island, lat. 18° 24′, was partly set up. The launch was overhauled and examined, deck-house caulked, &c.—*June* 30. Dr. Livingstone left in the launch for Tete or Senna, and the parties left behind were Dr. Kirk, Mr. Livingstone, three Kroomen, and a dog (besides Mr. Baines).

July 3. Troubles with the rain; the house leaks. The wind has been usually south-south-east, and strong.—*July* 4. River falls about 1½ inch per diem, and is 8 feet below its highest level.—*July* 5. Two canoes passed the island, going seaward, carrying rice and Kaffir corn, a native, speaking Portuguese, with a gun, bows 4 feet long, reed arrows, iron-headed and stout spears.—*July* 6. Another canoe with five or six natives, bringing plantains, eggs, and firewood for sale. Cloth is the medium of exchange; a tedious bargaining is necessary.—*July* 7. Photography begun. Sudden sickness of Messrs. Baines and Livingstone; the two canoes returned, and some alligator flesh was bought from them. The alligators are shy, so are the hippopotami.—*July* 19. Launch returned; Dr. L. had to stop five miles short of Senna, owing to the shallowness of the river, where the stores were landed. The authorities were disposed to be friendly. Mr. Baines is to accompany the launch up in her next trip.—*July* 20. Completed the reloading of the launch, 1600 lbs. of beads, &c., and set off in her. The river was broad, but the channel narrow, tortuous, and shooting from side to side. The more exposed parts of the banks of the islands are cut away by the stream at the rate of several feet per diem. Several alligators and hippopotami were fired at; none killed. Dr. Livingstone mentions that he had never seen an hippopotamus on land till within the last few days.—*July* 21. River broad and shallow; sounded with the whale-boat ahead, and got safely through the shallows; further difficulties.—*July* 22. Thick fog in the morning; reached the mouth of the Mutu, the river formerly laid down on the maps as the main branch of the Zambesi. It was a gully 10 feet wide and 4 feet deep, and its bottom was actually 9 or 10 feet above the surface of the water in the Zambesi. An old capsized canoe lay high and dry in it, where it must wait till next rainy season. The village of Mazaro is close by. The head-quarters of the Portuguese army are here now; two mutilated corpses were passed, and there was an attack from some rebel Landeens while the launch was there. The Portuguese Governor was sick, and given a passage in the launch to Cipanga, which was reached in the afternoon. Some large canoes, 30 feet long, 4 deep and 4 wide, were being neatly made out of single trees; their cost is estimated at *50l.* each. Latitude about 18° 1'.—*July* 23. Bought some fowls at Cipanga, and went on in the evening.—*24th.* Numberless small islands; used sails almost for the first time.—*25th.* Came to difficulty in the river, and grounded.—*26th.* Explored for a channel in the whale-boat, and had a great deal of wading. The native pilot was completely at fault. In evening, came in full sight of the double hill of Senna. The launch anchored, as before, some miles short of the town, and the party went on to it at night, for the first part of the way in the whale-boat, and for the last seven miles on foot.—*27th.* The view from Senna of the river and distant hills was fine. Some of the Landeens, allies of the Portuguese, were in the town and danced war-dances. There is a large stockade of green trees, lately planted, that have taken root; 500 people, come from a distance, are living in it for protection.—*28th.* Visited the store-house. The launch got up to within two miles of Senna. There was some difficulty in landing a saw-mill that had been brought in the vessel; the natives had no idea of pulling together.—*29th.* Returned in the launch and grounded; at last got near to Cipanga. The Portuguese and the rebels were encamped face to face on opposite sides of the river. Met a black man who spoke some English.—*31st.* Reached Expedition Island. Captain Bedingfeld, who had previously resigned, but had volunteered to continue his services as long as needful, is now relieved from the command of the launch.

Aug. 1*st.* Kirk joins the launch, and Baines remains on the island, where he is to make magnetic observations, &c.—*2nd.* The launch is reloaded, and starts under the command of Dr. Livingstone; his brother is left in command of the island.—*3rd, 4th,* and *5th.* Worked at taking down the iron house.—*6th.* The launch returned with news of a Portuguese brig having arrived at Quillimane.—*7th.* (Mr. Baines) very unwell and weak. Some canoes of runaway natives came to the island. A heavy squall of rain.—*8th.* Ill.—*9th.* The launch (including Baines) started up the river.—*10th.* Still ill.—*11th.* Ditto. Landed at Cipanga; much warlike bustle and some war-dancing. The stores were landed; (Baines and) Kirk were left, and the launch returned to Expedition Island.—*14th.* Conversed with some Zulus who had fled in former times from Inhambane through fear of Dingaan, and now fought in the service of the Portuguese. The cause of all this war is not very intelligible. Dr. Livingstone offered to mediate, but the Governor did not desire it.—*15th.* The people of Cipanga are abominably filthy in their habits.—*16th.* The launch arrived with the remainder of the stores. Captain Bedingfeld was left with Colonel Nunes for a passage to Quillimane; Kirk and Thornton remained in charge of the stores, and Baines goes up river. Rae, the engineer, is sick with excessive work, and Mr. Livingstone tends the engine.—*17th.* Reached Shamoeira. Several slaves were on sale for a fathom of cloth each.—*18th.* An accident with the whale boat: she fouled the paddle-wheels and capsized; more than one man was nearly drowned. Several stores were lost; part of the sugar-mill, some boiler tubes, spades, &c., but the boat itself was not hurt.—*19th.* Further troubles in navigating the shallows.—*21st.* Dr. Livingstone and his brother landed and walked to Senna.—*22nd.* Began settling with the natives who had worked at landing the stores; they asked 100 fathoms of cloth. The price of the country is one yard of cloth for carrying a man's load one league. The 100 fathoms was a great overcharge. The decision of the matter was deferred. Left Senna and steamed up the river. The islands were numerous and the vegetation became richer.—*23rd.* Made only about seven miles.—*24th.* Channel very intricate; the pinnace drew too much water. The loads were so adjusted that both launch and pinnace drew 2 feet 4 inches.—*25th.* Launch grounded, and was in serious danger. It was arranged that Baines should remain behind in the pinnace with one whale-boat and two Kroomen, and that Dr. Livingstone should go with the launch and one whale-boat only to Tete. The entire flotilla was too much for the launch to tow.—*26th.* The launch was detained for want of some slight repairs.—*27th.* Launch started. Baines rigged up an awning to the pinnace; the natives brought food to sell. There was a good deal of planted ground in the neighbourhood. Many hippopotamus spears were observed in the village.—*28th.* Arranged a cooking-place on board the pinnace.—*29th.* Natives rather troublesome; their canoes surrounded the pinnace: observed latitude 17° 9′ 30″.—*30th.* Moved the pinnace to mid-stream and anchored there.

Sept. 2nd. Made a tiller to the whale-boat; shifted anchorage about a mile.—*4th.* The grass was burning on the hills, and burnt leaves, &c., carried upwards by the stream of rarefied air, fell about the boat.—*5th.* Three canoes passed by.—*6th.* Sailed a little farther, but the boat was so heavily laden as hardly to be manageable by the small crew in this strong current and intricate river except straight before the wind. The days passed with no particular incident till, on the *17th*, the launch returned. It had been only three days returning from Tete. Mr. Livingstone was left at Tete. He and Mr. Rae had both been very ill. Some coal was brought on board.

The PRESIDENT, after returning thanks to Dr. Livingstone, and to MM. Baines and Thornton, and expressing the gratification which all must feel to hear that their valued friend, Dr. Livingstone, had been so well supported, invited remarks upon the subject before the meeting, and suggested that Mr. M'Gregor Laird, the ingenious designer of the little steamer, the *Ma Robert*, might wish to say something upon the statements made regarding the performances of that vessel.

MR. LAIRD, F.R.G.S., said that the steamer had been overloaded. It was designed to draw only 16 inches of water, and not 2 feet 6 inches. It was never intended to carry more than one or two days' coals. When she was first tried Dr. Livingstone had written to his (Mr. Laird's) brother in very congratulatory terms of her success. In the account given of the Zambesi it was interesting to observe the difference between it and the great river of Western Africa. The great width of the channels of the Leambiye, in the Delta, was very remarkable. The difficulty of navigating where it is broad and smooth was easy to understand, because the same body of water in a small narrow channel would be much deeper. What had particularly struck him in Dr. Livingstone's letter and in the journal of Mr. Baines was, that whereas in the Niger, up to the head of the delta, the whole width of the river, and the channels by which it is approached, does not exceed four hundred yards within a hundred miles of the sea, this other great river seemed to have a breadth of three miles. That was a characteristic of the Zambesi, and he thought would prove to be a serious disadvantage. He was afraid from that, and from the fact of the rapids occurring at such a short distance from the sea, that they could not with much confidence look forward to the time when the Zambesi would become a great channel of commercial enterprise. He hoped he might be mistaken in his judgment, but should be sorry to encourage expectations which he thought there were many reasons for believing would not be realized. However, it was very satisfactory to learn that Dr. Livingstone, whom they all so much admired and so deservedly esteemed, and his party continued, by the help of Providence, to enjoy such excellent health.

MR. LYONS M'LEOD, late Consul at Mozambique, said that he differed in opinion from Mr. M'Gregor Laird with regard to the navigableness of the river Zambesi, and its importance for commercial purposes. From information he had received from the Governor of Tete, and from a Portuguese who had been up and down it a number of times, he concluded the Zambesi to be navigable for at least eight months out of the twelve, for vessels drawing from four to six feet of water. It was well known that many of the rivers in America had steamers upon them with not half that draught of water. And it was a most important fact, and full of promise, that the banks of the Zambesi, from the Luavo mouths up to Senna, and even nearly up to Tete, were covered with very valuable timber fit for ship-building—a fact specially interesting to think of at a time when we were looking to every part of the world for timber for ship-building. A quantity of the timber of the Zambesi was from forty to sixty feet in length, and from three to six feet in the square. Some of these trees, from growing forked, would be peculiarly fitted for the futtocks and knees in ship-building. There were some beautiful woods also for furniture purposes; the roots as well as the trunks could be manufactured into handsome and useful articles. There were also dye woods used by the natives for colouring cotton, silk, and wool; and there was one tree which afforded a bark called in commerce *cinchona* bark; and, from the tree, as well as from the bark, quinine could be extracted, and the timber was adapted for the masts of ships. He had brought home with him from Mozambique some twenty-six specimens of the woods, which were now in the rooms of the Society at Whitehall-place, and might be seen by all who took an interest in the subject. He had also brought home specimens of the cotton described by Dr. Livingstone, which had the appearance of wool; and he had specimens, moreover, of cotton growing on the main land, opposite to the island of Mozambique. Oil, ivory, minerals, hides, as well as cotton, and other useful products, were to be had in abundance. Wheat could also be grown, and he was of opinion that Tete might become the granary of Southern Africa. England had always at the Cape a considerable body of troops, and it was very necessary that they should have a place whence the Cape could be kept supplied with wheat. In the rear of the town of Tete there was a mountain called the Carnera, from three to five thousand feet in height; here the natives have their plantations of wheat, corn, potatoes, &c., and also round about the town, over an extent of ten miles; so that in the event of the crops in the lowlands being destroyed by an inundation, they have a reserve in the mountain; and should the mountain crops suffer for want of rain, they are amply supplied by their plantations in the lowlands. He had no doubt that wheat could be grown there in sufficient quantity to supply the whole of Southern Africa at a cost of not more than 6s. a quarter. The subject of the navigation of the Zambesi had only to be taken up by mercantile men in order to the opening up of the whole interior of Africa. The whole east coast of Africa was extraordinary for its valuable productions; and in addition to its other commercial features might be mentioned the existence of a large number of deserted mines; unworked, simply because the Portuguese officials did not find it to their interest to open up the country and show it to foreigners; because, if they did so, the slave-trade would inevitably be suppressed. People now make their money and go away; and if legitimate commerce were entered into, the occupation of the slave dealer would be gone. The opening up of Eastern Africa would, without doubt, be a mine of wealth to this country.

MR. J. CRAWFURD, F.R.G.S., had not intended to say a word upon this subject, but could not refrain from so doing after what had fallen from Mr. M'Leod. He was glad that Dr. Livingstone had said nothing whatever on, or had held out no promising expectations of trade, great or small, with the east coast of Africa, or the Zambesi river; and it appeared to him (Mr. Crawfurd) that there was no prospect of any such trade as that spoken of by Mr. M'Leod. He agreed entirely with Mr. M'Gregor Laird in thinking that the Zambesi river was a bad one, and totally unfit for the navigation of vessels of any considerable burden. They had now the diary of Mr. Baines, and it was impossible to hear that diary read without coming to the conclusion that the river was crooked and shallow, and extremely difficult of navigation. Mr. M'Leod had mentioned the existence of some valuable timber on the banks of the river, but had not given the meeting the names of any of the valuable trees. The trees might be large and tall, and yet be good for nothing, and he did not believe that there was any timber on the Zambesi fit for the general purposes of ship-building. In fact, in all Europe there was one tree, in America two only, and but one in India, fit for ship-building: what those trees were in Africa fit for ship-building it was difficult to say. At present we had but the teak for India, the oak for England, and the live oak for America. And then it was stated that a large trade in wheat might be carried on, and this even grown, in 17° and 18° S. latitude, and nearly on the level of the sea. Now wheat never grew advantageously in any such latitude, and never would. Then, regarding cotton, African cotton would not suit the manufacturers of Manchester and Glasgow; and those who expected to get a supply of cotton from thence would be wholly disappointed; they would never get it. It was said the native cotton appeared like wool; that was on account of its extreme coarseness, and not on account of its feeling like wool in the hand. The good cotton of Africa appeared to have been imported; it was a foreigner. He had not the least doubt but that cotton would grow in

Southern Africa, but not without the employment of capital, enterprise, and skill; and where were these to come from? England was the only nation, except the United States, that could enter upon such a work, and it was not likely at all events that England would do so, seeing that she had enough territory on her hands already, equally or better fitted.

Mr. M‘Queen, f.r.g.s., said that with reference to the existence of coal at Tete, that was not a discovery now made for the first time; for twenty-five years ago they were tried at Lisbon, and also at Goa and Mozambique, on board, he believed, the *Nemesis*, and found perfectly good. Then with reference to wheat growing at Tete, he could tell Mr. Crawfurd that it does grow there. It was said that it could not grow there, because wheat did not grow so near the equator: now the finest wheat in the world was produced on the river Webbe, near Brava, close to the equator, and might be bought cheap, and in any quantity. As to cotton in Africa, it had been known for three thousand years, and very fine cotton too; and it was well known that in the interior the people had for ages manufactured their garments called Tangas of that cotton, which is very fine and very strong. Regarding the Zambesi he was satisfied there were many serious obstructions in its channel; but with some blasting here and there, and the use of other means, which would doubtless prove laborious, but not impracticable, there would be no place that a vessel fitted for the commerce of the country could not pass. Mr. M‘Queen farther called attention to the efforts that are being made by Portugal to strengthen its position in Eastern Africa, and along the valley of the Zambesi. They were establishing custom-houses at the mouth of the river, at Senna, at Tete, and Zumbo, and by a decree in January, 1855, they had defined the meaning of the government of the rivers of Senna to be and to include the whole of the Zambesi from the sea upwards, and specially to include all the ancient province of Zumbo, with the districts of country to the northward, situate on both banks of the river Arroango of the north.

Mr. Crawfurd again rose and said he had never before heard of wheat growing within the tropics, and at the level of the sea. They must come to 26° latitude before they could grow wheat. It would not grow either at Bombay or Madras. He knew that in Java, 6° or 7° south of the equator, it would not grow until you reached the elevation of 4000 or 5000 feet, and he could not believe with Mr. M‘Queen in the growth of wheat at the equator and at the level of the sea.

Mr. M‘Queen referred Mr. Crawfurd for information with regard to wheat-growing countries to what was said upon the subject in Krapf's Journals. He would also find that wheat grows on the banks of the Coanzo, not one hundred feet above the level of the sea. And as to cotton, he could testify, after ransacking almost every part of Africa, that there are few places in which the finest cotton does not grow all over that continent.

Colonel Sykes, m.p., f.r.g.s., could not suppose that his friend Mr. Crawfurd was serious in the arguments he had used. For himself he entertained very decided hopes regarding the commerce of the Zambesi. Dr. Livingstone had proposed the employment of engineering skill for the deepening of the shallow parts of the river, and the removing of obstructions by artificial means. It was well known that all large rivers formed deltas and branched into shallow streams as they approached the sea; the natural result of the deposits which accumulate as the water comes from higher lands and runs slower. He did not think there was any obstruction that might not be removed or avoided by means of human ingenuity, such as confining the whole stream to one channel of the delta. Mr. Crawfurd asked what can be the use of the timber without a botanical name, of which Mr. M‘Leod had produced specimens fit for ship-building; but was not that fact sufficient, whatever the name might be? What did it matter, although it might not be a *Tectona grandis*, a *Quercus*, or a *Pinus*, if the wood were of a quality adapted for ship-building? The argument therefore was good for nothing. And then as to Mr. Crawfurd's statement that wheat could not be produced on the Zambesi because it would not grow within the tropics; the fact being, that wheat was extensively cultivated in India, except south of 13° N. latitude. The finest wheat in the world might be found growing at the level of the sea, and one of the six species or varieties had long been imported because of its gluten in the preparation of cotton cloths at Manchester.* In spite, therefore, of the gloomy prognostications of Mr. Crawfurd, the public might still live in hopes that East Africa would be opened up to our advantage in a commercial sense.

The second Paper read was—

2. *Account of the Lake Yojoa or Taulebé, in Honduras, Central America.*

By E. G. Squier, Esq., of the United States.

[The paper will be printed in the Journal.]

The lakes of Central America are among its most interesting features, and, next to its volcanoes, are the most likely to arrest the attention of a traveller. Few of these are more remarkable than Lake Itra, which receives the copious drainage of a great basin, but has no apparent outlet, and Lake Yojoa, a sheet of water 25 miles in length, which has only lately appeared in our maps—a fact sufficient to indicate our very imperfect knowledge of the geography of Honduras. The waters of Yojoa escape by no less than nine subterranean outlets; there is also an open one through which enough water runs to float a canoe when the season is not very dry. The average depth of the lake is from 18 to 24 feet, and its elevation is 2050 feet above the sea-level. It occupies the centre of one of those singular basins, of which Honduras offers many examples, called not inappropriately "bolsones," or pockets. These are formed by the contortions of the mountains, whose spurs frequently coil round upon themselves, sometimes describing almost complete circles, and enclosing plains or lakes of varying extent and elevation. In these, the waters of the surrounding springs and the surface mountain drainage converge and form the commencement of considerable rivers.

The subterranean outlets of Yojoa traverse the mountain walls of the *bolson* in which it lies, and its waters reappear to light bursting through their opposite sides. They consist of limestone, probably much cracked by volcanic agency, resting upon a sandstone basis, and the subterranean outlets of the lake exactly coincide with the line at which this sandstone stratum is found to crop out.

Colonel Sykes, M.P., F.R.G.S., said it appeared to him that a company would have a great advantage in working a railway, the whole length of which would be under one government, namely, that of Honduras. He would be glad to know from Mr. Squier what was the greatest elevation that the railway would have to go over? That might be a serious matter in the successful working of the railway.

MR. SQUIER replied that the steepest gradient would be 1 in 60.

COLONEL SYKES said the formation then was only a question of expense, and the railway would be exceedingly valuable for international as well as commercial purposes.

MR. SQUIER said the gradients would be quite trifling compared with those on several of the American lines. The Ohio line, one of the best paying in the country, had to ascend elevations of 160 feet to the mile, and 140 and 130 were not uncommon. It was simply a question of engines—of mechanical power, which was quite within human control.

MR. W. J. HAMILTON, F.R.G.S., asked whether the waters of the lake were ever observed to diminish or to run off at certain periods by subterranean channels? Such a phenomenon was not unusual with lakes in a limestone region, where there was no apparent outlet. He observed that he was acquainted with several lakes in Asia Minor which were entirely drained every four or five years, by the water escaping through subterranean channels. He also asked, whether any observation had been made respecting the rainfall in this region, and how the lake was supplied with water?

MR. MOORE thought it might be interesting to mention, that a survey had been made by competent engineers, and had been reviewed by Colonel Stanton, R.E., and a detachment of Royal Engineers, sent out by Her Majesty's Government, of the route across which Mr. Squier proposed the construction of a railway; and the report of the surveyors, recently made, was to the effect that the making of a railway is perfectly practicable, with no steeper gradients or sharper curves than exist on the lines successfully in operation both in Europe and America. The project moreover would possess this great and unique advantage, that at either end of the line there existed a first-class harbour. The Governments of England and France had entered into treaties with Honduras, guaranteeing the route, and it now only remained for British enterprise to assist in working it out.

Mr. Moore fully concurred in the remarks of the President, and pronounced a high eulogium upon the talent and perseverance of Mr. Squier, the importance of whose endeavours could not be over-estimated; for to him mainly would have to be attributed, on the completion of the line, the achievement of one of the greatest enterprises of the age.

THE PRESIDENT said that this was a subject which claimed their special attention. The phenomenon of the escape of water by underground passages, on which Mr. Squier had particularly dwelt, was curious, and though not unknown in other limestone countries, had perhaps never been observed on such an extensive scale as in the case under consideration; in which while there were ten channels of exit from the lake, one only of these was by an open river course. The chief object which Mr. Squier had had in view in his arduous researches in Central America was to prove the practicability of a railway across the territory of Honduras; and if this great work were completed, it would certainly be a line of transit highly useful both to the United States and to England, and also one of the most important undertakings.

THE PRESIDENT would not have it forgotten that Mr. Squier was the gentleman to whom the world would be indebted for the origin of the project, and for calling the attention of his own countrymen and the European governments to the great value of such a line of railroad.

Fifth Meeting, January 24th, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*The Rev. S. W. King; Lieut. H. Lamb,* I.N.; *and James Allan, Valentine Labrow, Joseph Paul, and Theodosius Uzielli, Esqrs., were officially introduced upon their election.*

ELECTIONS.—*Captain Alexander Blakeley,* R.A.; *Captains T. G. Montgomerie, D. Nasmyth, D. G. Robinson, and James Walker, first assistants G. Trigon. Survey of India; Captain W. S. Sherwill, Professor of Surveying, Calcutta; Captain Thomas A. B. Spratt,* R.N., C.B.; *Lieut. John Townsend,* R.N.; *Major H. L. Thuillier, Deputy Surveyor-General of India; Captain E. C. S. Williams, officer of the Surveyor-General's Department; H. Stanhope Freeman, Vice-Consul Ghadames; Rev. Alexander Mackay,* A.M.; *Clark A. Duchet, Assistant-Surgeon,* R.N.; *and Hovenden Hely, T. Corbyn Janson, T. A. Thompson, and Arthur C. Vesey, Esqrs., were elected Fellows.*

EXHIBITIONS.—The third edition of 'Siluria,' by Sir Roderick I. Murchison; Sketches of the country and towns of the route of the Pernambuco Railway, by Colonel Westmacott, F.R.G.S.; and Findlay's Chart of the North Atlantic, &c., were exhibited to the meeting.

The Papers read were:—

1. *Journey in Mexico.* By CHARLES SEVIN, Esq., F.R.G.S.

[The paper will be printed in the Journal.]

MR. SEVIN left England in May, 1856, with the view of examining the copper and silver mines of the north-western provinces of Mexico, and of ascertaining how far the mineral wealth of these regions might be worked to advantage with English capital. He was accompanied by Messrs. Hickens and Schahl. The party reached Mazatlan in July, and started for their destination without delay. He describes Mazatlan as a cheerful, well-built town, of 12,000 to 15,000 inhabitants, with gardens in which the cocoa-nut and banana thrive, and far in advance of any other place in the northern and Pacific part of Mexico. Mr. Sevin's first point was El Fuerte. He took the road that led along the flanks of the Sierra Madre, travelling with mules, after the manner of the country, at the rate of 15 to 18 leagues a day, and sleeping at night on rugs spread on the floors of such ranchos as he selected for his night's quarters. There is another road to El Fuerte, which skirts the sea-coast and traverses the lowlands of Cinaloa. It is the easier road of the two, and the country it passes through is by no means unhealthy, notwithstanding the apparent insalubrity of its situation, but at the time Mr. Sevin was leaving Mazatlan, the usual summer rains had swollen the rivers and it was impassable. He passed through Culiacan, a town of 7500 inhabitants, and the seat of a bishop. It contains many private houses that were beautifully furnished, and belonged to individuals who had enriched themselves by means of some one or other of the numberless silver-mines of the adjoining Sierra. There are large silver amalgamation works in the place, and a Government mint, whose lessee gave Mr. Sevin a good deal of information. A considerable trade is carried on in the so-called Brazil or Nicaragua wood, which grows abundantly in the neighbouring Sierra, whence it finds its way to the little harbour of Altata. The inhabitants of Culiacan are of a less mixed race than those of Mazatlan, and the Indians of the surrounding country are described as good labourers, whether in the field or in mines. They are of numerous tribes, who all obey one single chief; they go almost naked, and carry bows and arrows. Mr. Sevin states, that in the mountain-ridges from Mazatlan to the boundaries of Chihuahua and Sonora, there are numberless works for silver amalgamation. By inquiry at every village he passed through, he invariably heard of some mining operations in the immediate neighbourhood, but all these undertakings are conducted on a small scale and in a very desultory manner. The miners can apply but very limited means towards their undertakings, and as soon as a *bonanza*, or piece of good luck, arrives, they cease to labour and begin gambling. Hence the want of wealth of the inhabitants is no proof of the want of wealth of the country. El Fuerte was more backward than Culiacan; it was for a while the seat of a provincial Government, but since then has fallen into decay. Extensive fields of maize and sugar-cane in its neighbourhood attest the natural fertility of the country, and produce large returns to those Mexicans who take the trouble to redeem these lands from their natural state of wildness.

From El Fuerte Mr. Sevin travelled through Chois to the old mining town of Urique. On his way he ascended the Sierra, and speaks in great admiration of the prospect from its flanks at an elevation of 8000 or 9000 feet. The varied tints of vegetation were peculiarly beautiful; the flanks of the mountains were embellished with numerous cultivated valleys, dotted over with ranchos, and the main chain of the Sierra Madre rose in abrupt cliffs above them.

A great number of silver-mines have been worked near Urique, but the old mine of S. Rosario is still the richest of all. The advent of Mr. Sevin's party created quite a sensation, for the want of a new element to elevate the population from its present miserable condition is severely felt among all classes in Mexico, and Mr. Sevin feels assured that energetic foreigners, with a bonâ fide purpose of trade and industry, would be cordially welcomed by the natives. His next point was Huacaybo, in reaching which he passed the famous mines of Jesus Maria, which are now worked in a most desultory manner by mining squatters; the richest of them is flooded with water. The copper lode at Huacaybo appears to be on an immense scale, and its position and capabilities are minutely described. At this point Mr. Sevin turned back; his mules were lamed, his stock of provisions and necessary luxuries were consumed, and he went back to Mazatlan by another route.

He reports on numerous mining districts, Bastoseágochic, Sententrion, Cerocáhuic, Monterde, Guadalupe el Calvo, El Parral, Hydalgo, San Diego, and Santa Eulalia. In the immediate neighbourhood of the last of these more than 250 mines have been worked, 50 of which are more than 200 yards deep and remarkably extensive, but the working of all of them has been checked since the expulsion of the Spaniards. He then passed to Batropilas; and, after visiting another group of mining districts as numerous as the last, and all of which are minutely described in Mr. Sevin's paper, that gentleman and his companions reached Mazatlan in November.

Mr. Sevin finds great fault with the cartography of the country he saw:—"As for the different rivers, mountains, and villages laid down in the different English and Spanish maps known to me, I have not seen one in which their geographical position was in accordance with my daily observations, and where the names of the localities were rightly spelled."

The paper concludes with a minute description of the physical geography of Chihuahua.

The President.—Geographers must be well pleased to know that a gentleman going to remote parts of Mexico without any mission to carry out our special objects, has of his own accord, and at his own expense, devoted so much labour and talent in laying before us a picture of a country, some parts of which have been visited by various British miners, but of which we have not yet had so clear a general sketch. The journey was not performed without difficulty; fire-arms having to be employed occasionally in those parts where the road was beset by robbers. We have, indeed, every reason to thank Mr. Sevin for having so successfully accomplished the object of his travels, and for having made the remote parts of Mexico much better known to us.

Mr. J. Crawfurd, F.R.G.S.—Mr. Sevin, perhaps, will have the goodness to give us some estimate of the amount of silver produced within the republic of Mexico. At the same time I would ask him, has the price of quicksilver greatly diminished? Since the discovery of the quicksilver mines of California, I understand that the amount of silver produced every year depends almost entirely upon the price of quicksilver.

MR. SEVIN.—It is impossible to state what amount of silver is found in Mexico, because the silver is exported in dollars, and also in bars, which are smuggled out of the country in great quantities; the exportation of silver in bars is altogether prohibited by law—therefore no exact statistics can be drawn up of the actual produce and exports of silver. In the republic of Mexico, in the year 1858, when I was there, there were thirty-five millions of dollars' coined. By comparing statements, it appears that the silver coined in former years did not amount to so much; but whether it is larger this year than last, I cannot tell. With respect to the price of quicksilver ten years back, it was one dollar and a-half in California, and two dollars in Mexico. Now, the price is about half a dollar in California: but at present the mines are involved in a law-suit, and the price will rise if the American Government should lay an injunction upon the working of the mines.

The second Paper read was—

2. *Extracts from Reports by* Captains BURTON *and* SPEKE, *of the East African Expedition, on their discovery of Lake Ujiji, &c., in Central Africa.*

Unyanyembe, Central Africa, 24th June, 1858.

SIR,—I have the honour to transmit, for the information of the Royal Geographical Society, a copy of a field-book, with a map by Captain Speke. The details contained in the map render all remarks upon the country superfluous until we may be able to communicate them in person.

We left the Lake of Ujiji about a month ago, and are now halted at this main depôt of Arab trade. Captain Speke has volunteered, when he and the rest of the party are sufficiently recovered from their present state of universal sickness, to visit the Ukerewe Lake, of which the Arabs give grand accounts. It lies nearly due north of Unyanyembe, at a distance of from 12 to 15 marches. Thus we shall be enabled to bring home authentic details of the four great waters which drain Eastern and Central Africa, viz. the Nyassa, the Chama, the Ujiji lake, and the Ukerewe. On Captain Speke's return, we shall lose no time in repairing to the coast, which, if we pass safely through perilous Ugogo, we may hope (D.V.) to reach about December of this year.

We have both suffered severely from illness. We were compelled to travel from Unyanyembe to Ujiji during the wet monsoon, and in the same season to embark in open canoes, exposed to wind and rain, sun and dew, and, when on shore, sleeping in mud to explore the lake—a labor of about a month. During this time we endured great hardships and ran not a few risks. Our limits of the lake were laid down by the accounts of the tribes.

We are slowly improving, and the thought of finishing our labors with what we hope will be considered most valuable results has much diminished the terrible wear and tear of mind caused by wants during our journey westwards. Our asses, 30 in number, ALL died; our porters ran away: our goods were left behind; our black escort became so unmanageable as to require dismissal; the weakness of our party invited attacks, and our wretched Balochi deserted us in the jungle, and throughout have occasioned an infinity of trouble.

We deeply regret that the arrangements for the expedition were not upon a more liberal scale. With 5000*l.* we might, I believe, without difficulty, have spanned Africa from east to west. However, the similarity of the two coasts and the accounts of travellers who have penetrated the western regions lead to the conclusion that the other half of the great continent just reflects the portions of which we hope to lay before you exactest details.

H. M. the Prince "Majid," and his native and Indian officials, have taken the greatest interest in our progress, and we have reason to be truly grateful to them. They were also urged on by the Consul de France, M. Ladislas Cochet, who, after Lieut.-Colonel Hamerton's unfortunate decease, has proved himself an active and energetic friend.

Your most obedient servant,

RICHD. F. BURTON, Captain Bombay Army,
Commanding E. A. Expedition.

To Dr. Norton Shaw.

Unyanyembe, 2nd July, 1858.

SIR,—I have the honour to request you will lay the accompanying map and field-book before the President and Council of the Royal Geographical Society. I send a plan of the whole route, as far as we have gone, on a diminished scale, as it is a safer means of conveying our entire work to you than by sending portions at a time, as I have hitherto been obliged to do. My office-copy, of course, is kept on the original scale, or the same size as the four sheets I sent you from the 20th November, 1857.

Whilst at the Lake Ujiji, I paid a visit to Kasenge Island, in the hopes of procuring an Arab boat, and had then the opportunity of seeing those two points south of it, Ukungwe and Tembwe, on its east and west shores. I was informed that the sea broadened a good deal to the south of these points, and finally turned off with a tail to the west. The distance from Kabogo to Kasenge (across the sea) I have set off from the compass-bearings, in conjunction with the latitudes; it makes a distance of about 23 miles: the time occupied in rowing was the same either way—11 hours incessant.

To diminish the disappointment, caused by the shortcoming of our cloth, in not seeing the whole of the sea Ujiji, I have proposed to take a flying trip to the Ukerewe lake, while Captain Burton prepares for our return homewards. This business must be done speedily, or the ponds and puddles drying up, will render our progress seawards difficult. The only instruments I shall take with me will be one sextant and horizon for latitudes, one compass, and one thermometer (boiling).

The year appears evenly divided into two seasons—wet and dry—each lasting six full months. We have fairly gone through six of wet, and now know nothing but sun and wind: both elements are very strong. This is a shocking country for sport; there appears to be literally nothing but elephants, and they, from constant hunting, are driven from the highways. All I have ever succeeded in shooting have been a few antelopes and guinea-fowls, besides hippopotami, near the coast.

I have the honour to be, Sir,
Your obedient Servant,
J. H. SPEKE, Captain Bengal Army.

To Dr. Norton Shaw.

THE PRESIDENT.—We cannot but gratefully return our thanks to the gallant authors of these communications. Many of us are well acquainted with the previous remarkable exploits in foreign travel which Captain Burton has performed, and he is now associated with a man who seems to be his equal.

I beg to call your attention in a very few words to the remarkable journey that these adventurous men have made. We are not yet acquainted with all the scientific details, nor able to answer for the exact longitude and latitude of different places; for you have heard how the travellers have been exposed to dire illnesses, and have been rendered almost incapable of making observations. They estimate, however, the distance of the Lake Ujiji from the Eastern Ocean, or Zanzibar Coast, to be not less than 500 miles in a straight line. This progress into the interior of Africa, on so high a parallel, is a geographical feat second only to that which our illustrious friend Livingstone has performed. Their observations made in traversing this tract of country may lead us to doubt the approximate estimate made by the eye of the missionaries, who had seen very lofty mountains, on a more northern parallel, and which, though under the equator, were said to be covered with perpetual snow, and consequently at least 22,500 feet high. Upon these statements, it has been supposed that these mountains might be an extension of the Mountains of the Moon.

I call your attention to a section, now exhibited, representing the altitudes of the region which Burton and Speke have traversed. The highest point they ascended, as I understand from their observations, is not more than 3,500 feet above the level of the sea. Consequently, if the mountains seen and approached by the Missionaries on the north, should be found to occupy the lofty heights assigned, they must subside from 22,500 feet to the low altitude of this, the leading coast range.

The lake which the travellers reached is stated to be 1800 feet only above the Eastern Ocean. This is *pro tanto* a corroboration of the speculation into which I entered in the year 1852, and which was first ascertained to be true by the important observations of Dr. Livingstone—that the interior of Africa is a great watery plateau occupied by different lakes, which send off rivers, which find their issue to the sea through gorges formed in the subtending coast ranges. The ridge traversed by Burton and Speke is, I presume, merely a continuation of the range of which Dr. Livingstone gave us such an admirable account, and which, in the country he examined on the parallel of the Zambesi, is simply a prolongation of the great coast ridge subtending that watery interior plateau to which I called your attention. God grant that Captain Speke may return from the hazardous expedition he is making to try and reach the more northerly and greater lake called Ukerewe. Hitherto there has been much mystery respecting the so-called interior sea, laid down under the name of Uniamesi, marked as 600 miles long, and represented as infinitely larger than the smaller lake of Ujiji. The northernmost lake of the two, lying as it does in a country of higher altitude, where the mountains reach, it is said, to heights of six or seven thousand feet, may after all prove to contain the chief sources of the Nile. We have, therefore, still before us for determination some of the most important problems that can engage the attention of geographers.

MR. M'QUEEN.—There is not much room for any observations regarding this route, except, perhaps, with reference to the position of the lake. The latter point is the only position that has been determined by astronomical observations. Every other position in the journey is fixed by bearings and estimated distances, and even those estimated under confessed difficulties. The lake I consider is too far to the west. You will remember that at the time Captains Burton and Speke were there, it was at the close of the wet season: they have given us no information of its depth, therefore we can form no idea how much it may diminish in the dry season. It may be that the whole is dried up. In a very curious account, the most curious I have ever seen, of the journey from the sea coast to the interior, to the coast of that lake, the Arabs stated that where they crossed the lake, it was twenty-four miles across—the distance now given. With respect to the position of the other lake, it will be found, should Captain Speke ever reach it, that it lies more to the east than west, and runs W.N.W. and E.S.E. The old maps of De Lisle, prepared by authority of the King of France 150 years ago, then the best, and even now good maps, show a large lake in the position indicated, with islands in it.

With regard to its connexion with the Nile, we need not, with the clear information we have, go there to ascertain that point. We have a clear and emphatic account of the Egyptian expedition sent by the late Mohammed Ali twenty years ago to explore the sources of the White Nile. The expedition reached 3° 22″ N. latitude, in the meridian of Cairo, or about 31½° E. longitude. Where the last astronomical observation was made was in 3° 30′ N. lat., and 31° 20′ E. long. The general bearing of the river from thence to its source was given as S.E., distant *one month's journey*, or about 20 days, say 200 miles actual travelling. Its course upwards, from the point mentioned, was through high mountains, rising in height as these approached the Equator, and where around the source they rose far above the limit of perpetual snow. Dr. Krapf saw those mountains from the banks of the Dana to the east of them. The cold, he was told, was exceedingly severe, and from them ran a river northward to the country of the whites. The Egyptian expedition collected many particulars, deciding that in those parts were the sources of the White Nile, say in about 35° E. long., and 0° 30′ N. lat. All accounts, ancient and modern, place high snowy mountains round the sources of the western branch of the Nile. The river was then in 3° 30′ N. lat., about 1370 feet broad, and falling very fast. Now I beg the President's attention to this fact. It was falling very fast on the 26th of January—so fast that the expedition did not venture to proceed any farther, for fear they should not be able to get back. The chief who resided there told them it would rise again in two months, at the end of March, which would exactly correspond with the sun coming to the north, becoming vertical near the equator. The river, therefore, can have no connexion with the lake, nor with any lake south of the equator, or it would not fall in the month of January: it would be rising at that time by the rains which fall from the beginning of November to the end of May.

With regard to the high lands spoken of, there cannot be the slightest doubt about it. The mountain must be at least 21,000 feet high to have three or four thousand feet of snow on the summit. It is utterly impossible an European could be mistaken, with his eyes, his ears, his feet, his hands, when crossing the base of the mountain, looking up to the top, and seeing the snow upon it. Mr. Rebmann saw the mountain in his second journey for weeks together. Two days before he reached Madjame, he encamped about 5 miles from it, in a cold almost insupportable. Even by moonlight he could clearly discern the snow. Next day he was not more than three miles from the summit, then traversing the lower part of the mountain over numerous defiles and chasms from 1500 to 2000 feet deep, with a great many streams of very cold water. Madjame is situated near the south-west base of the mountain. There, in the chief's residence, he saw the deep snow clad dome towering above him for days together. North-east of it, about 10 miles, is a lower mountain, which generally in the morning was *white with snow*, but which melted during the day. Mr. Rebmann took the bearing N.W., from the Taita hills. The distance from Mombas is at least 180 geographical miles. In two journeys from Mombas to Ukembane, Dr. Krapf in each saw the mountain daily for weeks together, and crossed rivers which descended from it. He could clearly discern and distinguish the snow from clouds which occasionally covered it. The height can hardly be less than 21,000 feet above the level of the sea; 17,000 feet above that level being the line of perpetual congelation, so near the equator, and immediately under it.

I also may observe with reference to the journey of Captains Burton and Speke, that they could not have travelled more than ten miles a day on the average. I am sorry that Speke is attempting to go away on an expedition to the north, for I think it is very doubtful whether he will ever reach this country again. I know something of the nature of tropical countries, and I cannot conceive anything so wild—his sad state of health considered, I think it is almost insanity—as this attempt to venture into an unknown country, perhaps worse than the country he has traversed.

With regard to the accounts given by the Arabs, I pay no attention to them; the Arabs make such gross mistakes about lakes of water. For instance, where rivers run into a lake, they often say they run out of it, and it requires great care and attention in examining their accounts in order to be correct.

I beg that it may not be supposed for a moment that I wish to under-rate in any way what Captains Burton and Speke have done. I have no hesitation in saying that theirs is the most correct route we have, but I think there are some parts of it that are not quite accurate, especially those portions on the first high lands from the sea coast.

To the west of the Kilimanjaro mountain, it was stated to the missionaries that there was a large lake, which flooded the country to a great extent during the rains, and when it receded left the whole country so covered with salt that it formed an article of trade in the interior. It was also stated that a large river ran into it from the north. With regard to the position of the lake in question, it will be found considerably to the south of the equator, in 3° of south latitude.

MR. F. GALTON, F.R.G.S.—I trust I may be excused if I draw a conclusion adverse to the suggestion of some geographers upon the manner in which the discoveries before us affect the probability of Kilimanjaro and Kenia being of that remarkable height which the German missionaries, Messrs. Krapf, Rebmann, and Erhhardt, have assigned to them. It must be recollected that in the view of these gentlemen Kilimanjaro and Kenia had no southern prolongations; they were in fact the southern abutments of a mountainous district, from whose feet an elevated plateau extended southwards with hardly a hill upon its face, but having a watershed on either hand. The only exception to this uniformity of surface consisted in the Nqu Mountains, which Mr. Erhhardt had seen from the neighbourhood of Mboa-Maji, and which Captains Burton and Speke have crossed and described. It must further be recollected that the missionaries' assertion of an elevated plateau running parallel to the coast with an interior waterparting, was opposed to an opinion current among geographers of that day.

Now, Captains Burton and Speke have, as you well know, made two expeditions; the one in the latitude of Kilimanjaro, up the Pangani river, where they came among hills and experienced mists and chilly rains and a climate that was literally unendurable to the natives who had accompanied them from the heated coast. Here, then, were signs of a mountainous country, and although circumstances prevented them from penetrating far enough to be able to give any positive testimony, or even to collect information upon Kilimanjaro, I gather from Captain Burton's writings that their opinion was in no way opposed to the statements of the missionaries.

The second journey of Captains Burton and Speke was the present one. They started from the coast two hundred miles south of Kilimanjaro, exactly where the missionaries had assured them they would find no hills at all, except the before-mentioned one of Nqu, and that, precisely, was the only hill they found.

I therefore maintain that Captains Burton and Speke's discoveries, so far as they affect in any way the question of these mountains, lend considerable weight to the testimony of the missionaries; and I consider that we are even less justified now than we were before in denying the probability of Kilimanjaro and Kenia being capped with snow. I fear this much vexed question must remain at rest until some traveller can give us positive testimony.

CONSUL M'LEOD.—As every thing connected with that inland sea must be interesting, I would venture to state what I have already communicated to the Government, that, when at Mozambique, I learned from the Arabs that the river Conducia, which discharges itself into the north-west end of the harbour of Mozambique, takes its rise in a lake, which, in the rainy season, communicates with an inland sea, and that the sea takes three days to cross.

MR. M'QUEEN.—That lake that you allude to is the Lake Maravi.

The PRESIDENT.—In endeavouring to give to the Society a general view of the efforts of our adventurous and gallant friends, I held it of some importance to call your attention to the fact, that whilst these supposed snowy mountains must be 22,500 feet high, if they really existed, under the equator, at all events they had no southern lofty prolongation; that in the parallel of Zanzibar the coast chain was low, and thus resembled the other coast ridges that subtend the interior of Southern Africa. The height of loftier mountains to the north, as Mr. Galton has properly stated to you, is still a matter for inquiry.

Leaving this point, however, to be determined by future explorations, let us advert alone to what our gallant countrymen have determined, and let us not mix up their exploits with our theories. The question now before us is, what

Captains Burton and Speke have done; and I repeat that they have confirmed the important observations of Livingstone—that the coast range that they traversed is much of the same height and composition as that which he traversed, and that like him they found in the interior that great watery plateau, the existence of which he demonstrated.*

In concluding the business of this evening, I may announce that I no longer have any hesitation in addressing my associates as *Fellows* of the Royal Geographical Society. For, in consequence of the application which I made, by the authority of the Council, Her Majesty the Queen has been graciously pleased to grant us Her Charter, and the Royal Geographical Society is now, therefore, placed on the same footing as the older scientific bodies of the country.

Sixth Meeting, February 14th, 1859.

Sir RODERICK I. MURCHISON, President, in the Chair.

Presentations.—*The Duke of Wellington; Captain E. M. Jones; Alderman Botterill, of Leeds; and T. H. Alsager, Joseph Mayer, J. Miland, M. H. Pasteur, L. E. R. Rees, W. C. Thomson, Arthur Vesey, and Theodore Walrond, Esqrs., were presented upon their election.*

Elections.—*Captain Andrew Clarke,* R.E.; *Lieut.-Colonel William Pottinger; Captain Louis Tindal,* R.N.; *Samuel Clarke,* C.E.; *C. Wentworth Dilke; Anthony L. Fisher,* M.D.; *and John W. Ogle,* M.D., *Esqrs., were elected Fellows.*

The Papers read were—

1. *On the "Aurora Borealis" in Greenland.* By J. W. Tayler, Esq.

Communicated by Sir W. C. Trevelyan, Bart., F.R.G.S.

The fame of the Aurora's beauty is well known. Travellers in the Arctic regions have written pages describing its fairy brilliance—how it enlivens the frozen solitudes of the north, and makes kind amends for the lost sun. An extended series of observations of the aurora would doubtless be of great interest and service. The few following observations have been made in Greenland as a small instalment.

The distant glimmer of the aurora, as sometimes seen in our northern horizon, can give no idea of its appearance in the Arctic regions, where for hours continuously the whole heavens from horizon to horizon is brilliantly illuminated with bands, rays, and clouds of luminous matter, waving, darting, and flickering its rays to and fro, and changing its hues from a faint phosphorescent gleam to golden, green, and rose—neither do any of the sketches I have hitherto seen give its true appearance, and are mostly confined to views of it when hardly above the horizon.

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* The Lake of Ujiji lies, according to the route-maps sent by Captains Burton and Speke, between the meridians of 26½° and 28° E. long. Its breadth, where crossed between Kabogo and Kasenge, is about 23 miles. From this, crossing to Uvira, near its north end, is 135 miles; the entire lake being 330 miles in length, between latitudes 3° 10′ and 8° 30′ S., and is there made to be about 700 miles from the eastern coast of Africa. Lake Ukerewe, south end, is estimated to be in about latitude 2° 40′ S., longitude 31° 30′. But the observations for longitude, made by Captain Speke at Ujiji, on the E. shore of the lake, which have since been roughly computed by Mr. George, place it in longitude 30° 23′ E. Should this position prove to be correct, the distance of the lake from the coast will be only 520 miles.—A. F.

I have observed it most frequently over the zenith, and therefrom half-way down to the horizon, the latter having been hid from my view by mountains varying in distance from 1 to 10 miles; the height and distance of these being pretty accurately known, have served as some guide in estimating the extent, height, and speed of motion of the aurora, the latter hereafter described as "Auroral motion."

The aurora, as it has appeared at Arksut, lat. 61° 14′ N., long. 48° 10′, has been of the following description:—

Long streams of light or luminous matter travelling at times with currents of air, but having within itself independent motions, such as—

1. Shooting rays downwards, never visibly reaching the earth or even extending long below the main body.

2. Rolling horizontally and doubling itself up in waves, precisely as if a long fringed ribbon were held at both extremities, edges up and down, and a waving and serpentine motion communicated to it.

3. Parts brightening by doubling of the band; becoming so opaque that stars of the first magnitude cannot be seen through it.

4. Rapid and changeable motion to and fro, with and against the current of air.

5. Parts of the aurora, without travelling elsewhere, gradually disappearing, and again becoming apparent in the same place without having visibly come from the main body.

6. Bands forming circles and spirals, and rarely into hemispheres, like an enormous parachute over the zenith, with rays projecting all round towards the earth.

The aurora, or its downward rays, do not appear to be attracted or influenced by high mountains, or icebergs, or water, appearing equally over them all, although the long projecting rays shooting downwards would seem to indicate attraction; but this action is not increased when passing over high mountains.

Fitful and changeable as are its motions, one at least appears to be a law, viz. its long bands always occur at or nearly at right angles with the magnetic poles. These bands almost invariably stretch east and west, or a point or two on each side, never going beyond north-west and south-east or south-west and north-east. This is the case whether the wind be north, south, east, or west. With north and south winds the bands still hold their east and west direction, but are curved to leeward, like any long, yielding body would be if secured at both ends.

With regard to height, extent, and density of the aurora, I have observed as follows:—1st, as to height, about 10 miles west from my place of observation is a mountain 4000 ft. high; I have never seen the aurora or its rays descend below this, and consider it never occurs nearer the earth than between 4000 and 5000 feet, though its altitude is extremely varying, ranging probably from that distance to 10 or more miles in height. The most certain means of estimating the height I found was to observe the effect of the aurora on clouds, and *vice versâ*. I have seen it with the cumuli. When the aurora is above these, the clouds appear as dark masses on it, and hide the light; but when the aurora is under the clouds (that is, nearer the earth than the clouds), the light is reflected by the clouds, and passing through the aurora makes the latter appear more bright in that part; the whole under surface of the cloud is also completely illuminated.

The splendid red and green colours of the aurora are in general only seen when the air is clear and free from vapour and clouds; these colours are not quite so intense as the solar iris, but considerably brighter than the lunar.

Regarding the speed of "auroral" motion (by which I mean the transmission of a wave in the band of light from one part of the band to another, independent of wind), I have remarked on several occasions, when the aurora was partly above and partly below the clouds (which I estimated 10,000 ft. high), that a wave moved from a part of the band, crossing the summit of a mountain to the zenith, in periods of from 4 to 8 seconds, rarely half a minute. The mountain was 4000 ft. high, distant 10 miles, height of eye of observer 24 ft. Supposing the height of the clouds to be judged with moderate accuracy, we could calculate approximately the speed of the "auroral" motion. The wind has no influence on this motion, since the waves of light run equally rapid and frequent to windward or leeward.

By reference to the journal it will be seen when the aurora was above or below the clouds: the temperature, barometer, and weather being given, will enable any one interested in this subject to judge of the nature of the clouds, and estimate nearly their height.

From the foregoing remarks it will be seen that the aurora is confined to certain spaces at no very great altitude, and is not, as has been supposed, a luminous or electric vapour reaching to the earth, and encircling the beholder; that by doubling on itself it becomes more opaque, showing a certain amount of density, inferior however to clouds; that its light is independent, and not a reflection of light from the sun, since its low altitude precludes it; that this vapour or luminous matter has a motion independent of currents of air, and that it has diamagnetic properties; that whatever may be the cause of luminosity, it is composed of matter capable of decomposing rays of light, since the under edge of the aurora exhibits the prismatic colours; that it has within itself a strong cohesion or attraction amongst its parts, holding itself entire in strong winds, and not being scattered abroad like smoke or vapour, yet showing the force of the wind upon it by being curved more or less to leeward.

Since these few facts are insufficient to draw conclusions from, or even to prove definitively the invariableness of any of the appearances I have described, I content myself with the above remarks.

J. W. TAYLER.

Arksut, Greenland, August, 1858.

Explanation of Figures.

Fig. 1. Appearance of the aurora, when above the clouds.
" 2. Ditto, below the clouds.
" 3. General aspect of an auroral band.
" 4. Aurora, in the form of a parachute, observed only once.

The PRESIDENT.—I beg to return the thanks of the Society to the author of this notice, and also to our friend Sir Walter Trevelyan for having communicated it. As there is no gentleman present who can throw more light upon this subject than that distinguished Arctic explorer, Sir George Back, I call upon him to give us a condensed account of his own observations upon the aurora borealis.

REAR-ADMIRAL SIR GEORGE BACK, Vice-President.—A condensed view of a phenomenon always moving is not an easy thing. I think great credit is due to Mr. Tayler for having given a condensed and graphic description of the aurora borealis, as seen by him at Arksut, in Greenland. I may as well say that Arksut is near Cape Farewell, in lat. 61° 14′ N., long. 48° 18′ W.; and as, according to Sir John Franklin and others, the 65th degree of latitude is the most favourable for the observation of the aurora borealis, Mr. Tayler was well situated for that purpose. The aurora generally commences somewhere about W. by N., or a little more northerly, and shoots up in rays or beams, but frequently in arches, extending across the zenith to the opposite horizon; sometimes returning in a counter-motion, and being met by rays of almost prismatic colours in the shape of a V, completing the semi-circle;

at other times with upright pencilled rays, until they appear again to shoot to and fro, and gradually disappear in the southern sky. Streamers, too, frequently shoot, as he has described them, from perhaps an altitude of 50 to 60 degrees, more or less, and are visible in various places almost at the same moment of time. They vanish at their northern faces, and reappear afresh at their southern, being again projected downwards until they disappear in the southern horizon; lost to sight for a brief interval, and bursting instantaneously into view; once more drooping and expiring when the southern fringe had reached 30 degrees south of the zenith. I have seen at Fort Reliance, two years in succession, many such appearances; but on one particular occasion the sky was generally diffused with the aurora, which quickly separated into arches, beams, and rays, and darted to and from the opposite horizons; then as suddenly opened up into bands or curves. It speedily rushed across the zenith, nearly to the opposite horizon; became broken up in different forms; darted upwards anew and formed near the zenith a beautiful corona borealis; then, dispersing in an instant of time, it formed itself into six distinct figures, representing the letter S, and moved with incredible velocity, thus presenting the strange appearance of so many huge snakes whirling and twisting in every direction, until exhausted, as it were, by excess of motion, the beautiful phenomenon again receded and dissolved in the south, leaving in the spectator a sense of extreme loneliness, almost painful. As for the colours of the aurora, they appear nearly, as Mr. Taylor has stated, from steel grey to pale yellow, orange, red, &c., varying in lustre according to circumstances. The aurora is seldom seen at a lower angle than 4 degrees from the horizon. I may say, in the first instance, that there are two motions, the direct and the lateral. The direct motion of the aurora is usually in a plane, seldom varying more than 22 degrees from the magnetic meridian; while the lateral motion is at right angles to the magnetic meridian. Thus, an arch of the aurora will sometimes move from the zenith 60 or 70 degrees towards the southern horizon, whilst its extremities east and west remain nearly stationary. Beams and flashes, contrary to the others, are generally inclined in the direction of the dipping needle. Near the magnetic meridian they assume a position perpendicular to the horizon; but at some distance east and west they decline towards the perpendicular, at different angles, having occasionally a small deviation of parallelism among themselves. I think Mr. Taylor says that the aurora, according to his observation, is not a luminous or electric vapour reaching to the earth. It is true that in seven winters I never saw the common cork-ball electrometer charged; but with a more delicate instrument —more susceptible—I have seen it drawn away 25 minutes, and afterwards to upwards of 30 degrees. As regards magnetism, which is always interesting, I may mention, that Professor Christie, who was then Secretary of the Royal Society, had a needle 8¾ inches in length made expressly for me. It was suspended so delicately that the slightest cause of disturbance affected it. This needle was frequently disturbed by the aurora. On one occasion it was deflected to 7° 50′, consequently nearly to 8° on one side of its zero, at a temperature of 20° minus zero. The arc of the instrument was only graduated to 10°, thus putting at rest for ever the question of the aurora affecting the needle. I may also mention in connexion with the same instrument, that when the arches have been urged with a counter-motion from one horizon to another, across the magnetic meridian, the needle has vibrated to and fro, east and west of its zero, and then again suddenly stopped; and at one time actually dipped at one end of the needle 8 minutes. As to the height of the aurora there are various opinions. One philosopher thought it to be 800 miles high. Another, Mr. Dalton, considered it to be 100 miles; but that was deemed to be erroneous. In our more recent journeys and voyages to the northern regions, it was the general opinion, founded on observation, that the aurora varied between a height of two to four miles, but very frequently much lower, as described by Mr. Tayler. Indeed, it was very common to see the lower surface of nebulous clouds illuminated by polar light, thus showing its proximity to the earth. I remember Sir Edward Parry, when in a different latitude observing the aurora, saw a bright ray shoot suddenly down between him and the land, distant at that time only 3000 yards. I have frequently seen it nearly—that is to say, apparently—touching the tops of the pine-trees, situated on a slight elevation, about a mile and a half from my observatory. And I may take this opportunity of mentioning, for it will not be devoid of interest to some in this meeting connected with the old North-West Company, now the Hudson Bay Company, that as Mr. Clark, one of its officers, was passing over a portage of the river *Maligne*, the coruscations of the aurora were so low and vivid that the Canadian voyageurs threw from them their knives, axes, or whatever metallic things they were carrying, and actually fell with their faces to the earth. Lastly, I would remark, that many have thought—old travellers especially—that there was a noise caused by the aurora resembling the rustling of a flag in a strong breeze. We almost thought so too, I mean Franklin, Richardson, and myself, for a long time; but we discovered that it was simply the effect of severe cold after a comparatively warm day; that is to say, when the snow had been thawed during the day, and a cold of 30 to 42 degrees minus zero had succeeded at night. On those occasions we heard a hissing sound, and when the aurora was in rapid motion, it was natural to associate that motion with the sound. However, that was not the case. Nevertheless, the Indians and many of the old residents in the Hudson Bay Company's territories are of unanimous opinion that its motions are sometimes audible.

The PRESIDENT.—Sir George Back has left very little more to be said respecting this remarkable phenomenon. I am happy, however, to see near me Admiral van Dockum, the Minister of Denmark, that power to which Greenland belongs; the country in which Mr. Tayler made his observations. It gives me pleasure to remind you that the Danish Captain Graah, a distinguished maritime explorer, has admirably described the phenomena of the aurora borealis in a work which has been translated into English at the expense of this Society.*

The second Paper read was—

2. *Discovery by* Captain JOHN PALLISER, F.R.G.S., *and* Dr. HECTOR, *of Practicable Passes through the Rocky Mountains within the British Possessions.*

Communicated by the Right Hon. Sir E. BULWER LYTTON, Bart., M.P.,
Her Majesty's Secretary of State for the Colonies.

CAPTAIN PALLISER'S despatch is dated from Fort Edmonton, his winter quarters on the Saskatchewan river, and narrates the proceedings of himself and his party about the east flanks of the Rocky Mountains and the upper course and tributaries of that river during the previous summer.

The chief results before us lie in the discovery and mapping of the following numerous passes:—

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* *See* Graah's Greenland. J. W. Parker, Strand, 1837.—ED.

Two from the S. branch of the Saskatchewan to the Kutanie river, viz., the Kananaski and Vermilion.

Two from the Kutanie river to the Columbia river, viz. the Lake and the Beaver Fork.

One between the S. and the N. branches of the Saskatchewan, viz. the Little Fork.

One from the S. branch of the Saskatchewan to the Columbia, viz. the Kicking Horse.

In addition to these, the Northern Kutanie Pass has been laid down, and found to be within British territory.

The most promising of all the routes, for the purpose of crossing the Rocky Mountains, appears to be that laid down by Dr. Hector. He followed the Bow River tributary up to the water-parting of the continent; then continued forward until he reached a transverse water-parting, which divided the waters of the Columbia and N. Saskatchewan on the one hand from those of the Kutanie and S. Saskatchewan on the other. There he found the facilities for crossing the mountains to be so great as to leave little doubt in his mind of the practicability of connecting the plains of the Saskatchewan with the opposite side of the main chain of the Rocky Mountains, even by means of a railroad.

As regards the scenery of the Rocky Mountains, there is a remarkable absence of peaks. Fine glaciers fill the upper hollows of the range; and from different arms of the same large glacier proceed the N. and S. branches of the Saskatchewan. The snow-line appears to have been between 6000 and 7000 feet above the sea. In lat. 51° 40', at a height of 6300 feet, snow was lying in patches under the shade of trees, notwithstanding a clear midday sun.

There is very little game about the mountains; the most remarkable animal of those that exist is the white goat. It lives on the highest parts of the range, and seldom descends. As a consequence of the absence of game, Indians are rarely met with, and none of them possess other than very vague knowledge about the passes. The Kutanie Indians are a wretched set, though rich in horses.

The country of the Upper Saskatchewan was found to be far less fertile and well timbered than had been supposed. There are large tracts of worthless soil, and constant prairie fires have utterly destroyed the greater part of the timber—so much so, that the travellers were usually in difficulty owing to the want of firewood.

About Fort Edmonton wheat is raised, and cattle remain out of doors the whole winter. Potatoes grow excellently.

The PRESIDENT.—In returning thanks to Captain Palliser, Dr. Hector, Lieut. Blakiston, Mr. Sullivan, and the other gentlemen employed in this expedition, and particularly to Sir Edward Bulwer Lytton for his kindness in communicating this despatch to us, we ought to be proud of this important communication, for I venture to say that without the stimulus of the Royal Geographical Society the expedition never would have been undertaken. The object we geographers had at heart was to ascertain whether practicable passes through the Rocky Mountains could be found within the British territory. On the other hand, Her Majesty's Government very wisely determined, as a prelude to such explorations, that Captain Palliser should occupy a large portion of his time in determining the possibility of a commercial route being established between Canada and the important possessions of the Hudson Bay Company, and through the last to our now important colony of British Columbia, and so on to Vancouver Island. The result of the observations of our travellers as to the nature of the easternmost of their explorations, and the relative altitudes of the ground, and the difficulties of the portages, has been already laid before you. As your President, I would rather wish to restrict the discussion to the nature of that great region to the west of Lake Winnipeg, the region, in short, of the affluents of the North and South Saskatchewan rivers, which, we are told, is capable of becoming a great and important colony. Captain Palliser describes this region as being fertile, capable of producing anything, and good crops of grain.

The chief geographical feature to which I would call your attention is the remarkable fact that where the Rocky Mountains rise to their highest altitude, there are to be found the lowest depressions or passes; so that while the Americans in travelling to the central parts of California have to encounter passes at 7000 feet above the sea, Englishmen may on their own ground travel through gorges only 5000 feet above the sea.

Gentlemen, there are several persons present who can give you much information on this subject. For example, I see Mr. Ball, the Under Secretary for the Colonies, who in the late Government was a most active organiser of this expedition. Then we have a gentleman (Mr. Edward Ellice), a distinguished member of the Legislature, who has a large stake in the Hudson Bay Company, which has for so many years governed the region with great benefit to the poor Indians; then we have also Lord Bury, who has recently returned from America, and has earnestly studied this subject, and who is emulating his noble father in his zeal for geographical science. Sir George Back is also present, who is familiar with the eastern waterparting of the Rocky Mountains; whilst I hope that from the discussion which may ensue, the Bishop designate of British Columbia, who has honoured us by his attendance, may gain some useful knowledge preparatory to the important mission on which, thanks to the liberality of one of the noblest and kindest of our countrywomen, he is about to proceed.

MR. JOHN BALL.—I feel that I can say but very little. It happened to be my duty to assist in sending out this expedition, an expedition not due to the Government, but to this Society. I must say that I feel great satisfaction in the intelligence which we have recently received from them. For the first time since nearly forty years they have traversed a district which has borne a very ill name among white men, I mean the country of the Black Foot and Blood Indians. That they have done so in safety is due in some degree to favourable circumstances, but also to the great tact and skill of Mr. Palliser in conciliating their affections. Arrived at the foot of the Rocky Mountains, their expectations have been far more than realised. Not one pass, as they supposed, but three practicable passes have been discovered. Two of them seem to merit, in an especial degree, the attention of the public in this country; because, since that expedition was sent out, great national interests have become involved in the communication with the west coast of America, in consequence of the gold discoveries in that far distant region. The new southern pass, which was discovered by Mr. Palliser, leads into the valley of the Kutanie river, and carries you down the course of that river into American territory. The two more northerly passes are entirely upon British ground. One of them, the Vermilion Pass, leads to the Kutanie river, near to its source; and a second accessory pass presents itself immediately you have crossed the dividing ridge of the Rocky Mountains. Turning to the right, with scarcely any perceptible elevation, you pass from the head waters of the Kutanie river to a branch of the Columbia river. Northward of that is another pass, a little higher, called the Kicking Horse Pass, of which I have not been able to hear the full details. It remains to be decided which of these two passes—both of them very eligible in point of geographical position—will be the more available for use, subject to the condition that for a great part of the year the mountain range must be covered deep in snow. One word, however, as to the mode of getting to this country. The real difficulty appears to me to be in traversing that small portion which lies between the corner of Lake Superior and Rainy Lake. It does appear, from information I have received from Mr. Palliser, that there is no insurmountable obstacle in carrying a land-road, for a certain distance to the westward, parallel to the course of the White Fish River, which falls into the Kammistaquoia somewhat below the Kakabeka Falls. But then there comes a region of swamps and rocks, so intricate that you never seem to remain long on either land or water; and without some enormous outlay, there seems no practicable mode of making a land-road in the direction which they took. Nor is there any convenient way of travelling by water, except by the tedious one of small canoes and crossing portages, of which 26 were found in the lower course of the White Fish River. Why I allude to this matter is, because the small space of 50 or 60 miles from Pigeon River to the Kammistaquoia, so far as I know, has never yet been explored by white men; and if it should be found that there is a sufficient amount of dry and solid land on which a road can be made, it will throw open to British enterprise, in the valley of the Saskatchewan, a tract of territory of greater extent than the whole of France and England put together. Before sitting down I may allude to one peculiar feature of this country, and that is the extraordinary nature of the watershed in the Rocky Mountains. Except in the Carpathian chain, we have nowhere in the old world anything exactly like it. The rivers seem to pass across the axis of greatest elevation. The two main branches of the Saskatchewan river pass to the westward of the highest mountains in the chain, Mount Murchison and Mount Hooker; and on the western side of the chain we have this extraordinary fact—two rivers flowing parallel to each other a few miles apart for a long distance, the Columbia and the Kutanie, one running to the N.W., and the other to the S.E. It appears to me one of the most singular facts that we know of in physical geography.

Lord Bury, M.P., F.R.G.S.—I shall certainly make it a point to follow in the general direction which you, Sir, have pointed out; but, like the last speaker, I, too, cast rather a longing eye to that corner of the country to which he has alluded. With regard to the present expedition, Captain Palliser has had the advantage, which he shares only with the explorers of some parts of Africa and Australia, of dealing with an almost unknown subject. The reason why we are ignorant of this country is, that it has been to a certain extent shut up by the Hudson Bay Company. That Company holds territorial sway and exclusive right of trade over the whole of the country. The importance of the discovery of these three passes must depend in a great measure upon the value of the land on each side of the Rocky Mountains. If the land to the eastward between Lake Winnipeg and the Rocky Mountains, and the land to the westward near to the new colony of Columbia, be valueless, then the discoveries which Captain Palliser has made will be equally valueless. But if we can show that on the development of the country which lies between Lake Winnipeg and the Rocky Mountains the future greatness of British North America almost exclusively depends, then we shall be able to realise the full importance of these discoveries. We have in British territory two of the greatest harbours in the world,—on the Atlantic shore the harbour of Halifax in Nova Scotia, and on the Pacific shore that of Esquimault in Vancouver Island. I cannot resist expressing a hope that at no distant day we shall see these two connected; and then it will be that the importance of this discovery will come into play. And now, if you will allow me, one word about this corner of the country which has been alluded to by Mr. Ball. He intimated that in the *hauteur des terres* separating the waters running towards Hudson and James Bay, and the waters running towards Lake Superior, lay the greatest difficulty which had been as yet encountered. I suppose that the gentlemen present know that for the last two years the Canadian Government, as well as the Home Government, has had an exploring party between Lake Superior and the Red River. I have seen the result of their explorations, and I do not think there exists such an insuperable objection to the formation of a land road as he supposes. I have myself been over that height of land, and the greatest obstacle is a swamp called the Savanne. In that swamp, in the space of three-quarters of a mile, there is a fall of thirty-one feet. Except in isolated places, that swamp is nowhere more than three or four feet deep; and at the bottom you get a strong clay. I venture to say, on the authority of greater men than myself, that it is one of the easiest parts to form a road. An American would cut down the brushwood and pile it on the top of the swamp, then cut down a few trees and pile them on the top of the brushwood, and that would form a temporary road; and when a better road was wanted it could easily be made on the top of the substratum thus laid. With respect to the remainder of the country between Lake Superior and Red River, I think no great difficulty exists. I am one of what would in old times be called a company of adventurers who have contracted with the Canadian Government to carry their mails from Canada to the Red River. We do that, with our present small means and inefficient organisation, twice a-month without difficulty. That fact is a sufficient argument to the objection that the Savanne swamp is an insuperable obstacle to road-making. With respect to the value and extent of the cultivable land between Lake Winnipeg and the Rocky Mountains, Mr. Blodget, the distinguished American climatologist, estimates that it contains altogether about 500,000 square miles fully adapted for the operations of agriculture in every way. Assuming that estimate to be correct, about 437,000 square miles, or more than 717 millions of acres, would be in the British territory. Although but a small part of the territory of North America, it would be enough to support all Great Britain and her dependencies. We know that the buffalo can winter on the Upper Athabasca just as easily as they can in Minnesota. We know, too, that on the two branches of the Saskatchewan all the grain grown in temperate latitudes can be easily raised. Just south of the boundary-line the great equestrian tribes of the Indians winter their horses, and it is not to be supposed that that boundary, a mere astronomical line, separates the fertile regions of the United States from a sterile region beyond. Experience has proved that that is not fact. Buffalo and wild cattle can live perfectly well there; and wherever grain is tried it has succeeded almost beyond the hopes of those who have undertaken it. The want of a market has been the great thing which has stopped them.

The noble Lord then entered at some length into the climatology of the territory in question, to show that it was highly favourable for colonisation as far north as Lake Athabasca and Peace River, and even in some places on the Mackenzie River as high as 60° N. latitude.

The PRESIDENT.—I again congratulate the Society upon the value of the

Reports which have been read, and also upon having heard from Lord Bury such an able exposition of the physical capabilities of this great country. I have also great pleasure in announcing that, in reply to an application which I made to obtain permission for Captain Palliser and his associates to return to England by crossing the Rocky Mountains into British Columbia, Sir E. B. Lytton has acceded to that request, which had indeed been preferred by the travellers themselves; and thus many most important and interesting additions will doubtlessly be made to those discoveries the nature of which we have been considering this evening.

Seventh Meeting, February 28th, 1859.

Sir RODERICK I. MURCHISON, President, in the Chair.

Presentations.—*Lieut.-General P. Cannon; Viscount Strangford; James Brand, Pascoe St. Leger Grenfell, T. Corbyn Janson, and Thomas Sopwith,* c.e., *Esqrs., were presented upon their election.*

Elections.—*Major A. C. Cooke,* r.e.; *Lord De Blaquiere; Commander W. N. W. Hewett,* r.n.; *Rev. Evan Lewis,* b.a.; *Captain Kenneth Murchison; Captain Robert Howard Price; Lieut.-Colonel J. F. D. Crichton Stuart,* m.p.; *Rev. F. W. Tremlett,* m.a.; *and Henry Hulse Berens; William Ewart,* m.p.; *Henry Hansard; William Mitchell; Thomas Phinn,* q.c.; *Edward Rawdon Power, and Henry William Willoughby, Esqrs., were elected Fellows.*

Auditors.—Thomas H. Brooking and E. Osborne Smith, Esqrs., on the part of the Council, and Thomas Lee, Esq., and the Rev. J. Worthington, d.d., on the part of the Society, were appointed Auditors.

Exhibitions.—Two large paintings by Mr. Atkinson, showing the character of mountain scenery at the source of the Bascan, and the snowy chain of the Ac-tu, were exhibited.

The Papers read were :—

1. *A Journey through some of the Highest Passes in the Ala-tu and Ac-tu Mountains in Chinese Tartary.* By T. W. Atkinson, Esq., f.r.g.s. and g.s.

During my wanderings in Central Asia I came upon several large river-beds, in some of which there was no water, in others the streams were so small that it was difficult to account for the formation of such enormous water-courses. I shall therefore attempt to describe a phenomenon caused by a terrible earthquake at some distant period, which rent the mountains asunder, letting out the water of a large Alpine lake, which has formed one of those vast channels across the plain. I also hope that my description will convey some idea of the physical geography of this extraordinary region.

As it was necessary to await the arrival of the tribes, I determined to extend my ramble to a pass about twelve hours' ride to the eastward. For the first mile the steppe was covered with good grass, after this we came upon a tract of sand and pebbles, with occasional tufts of steppe grass, extending over about three miles; this led to a sandy plain entirely deprived of vegetation. Far to the north we could see some green patches of verdure surrounding a lake; but with this exception, the entire country appeared an arid desert. In about an hour and a half we reached the brink of one of the dry river-beds frequently found in these regions. This was a large one, not less than a mile and a half in width, and 130 feet deep, and the banks being nearly perpendicular, it formed a complete barrier to our progress in this direction. I sent two men along the bank, and took my only other companion upwards, searching for a place by which we could descend. After a long and fruitless ride, the report of a gun and the waving of a handkerchief by the two men brought me to a spot where they had discovered a track made by deer and other animals descending for water.

We rode over the brink and began to descend slowly, crossing a broken part of the path with great difficulty; at length the first man and myself reached the bottom. As we stood watching the other two the sand suddenly gave way under the feet of the last horse, and both man and animal rolled down apart from each other from a height of about 40 feet. We thought both killed, but on hastening to their aid, they rose to their feet; the horse gave himself a shake, and began to kick and plunge furiously, and the man burst into a fit of laughter.

All hope of returning by this track was now at an end, and we rode on making vain guesses as to what had become of the stream which had scooped out this formidable hollow. Sand and pebbles covered the greater part of the surface, interspersed with patches of fine grass; but near the middle we found several pools of fresh water, with a small stream uniting them. They were surrounded by beds of fine sand on which were the foot-prints of several animals of the deer tribe. Near one pool other foot-marks attracted the attention of my men, one of whom called out that the barse (tiger) had been there. On reaching the spot I saw distinctly the prints of huge feline paws, though not recent: most probably this tiger had followed the other animals into the mountains, whither they had gone in search of food.

A little farther we found a broad bed covered with large stones and coarse gravel, over which a stream of water was running rapidly, making it very difficult to ford; and the opposite bank proved as high and abrupt as the one we had descended. It was now past midday, and the pass in the mountains appeared still far distant. Questioning the Kirghis guide, I ascertained that he had never crossed this country before, and could tell me nothing reliable about the pass. Quickening our pace over the sandy steppe, at five o'clock we turned into the great ravine we had been seeking. The first few hundred yards was between grassy slopes with a little rivulet in the centre; having passed some rocky masses, the rugged mountain jaws opened upon us in all their grandeur. This was a terrific rent; the dark purple slaty rocks had been riven asunder by the granite, and heaved up into craggy precipices of enormous height. In some parts the rocks were broken into sharp points, in others they were piled up like huge towers overhanging the base of these mighty cliffs. To add to the wildness of the view, three large eagles were soaring far above our heads, and several were perched upon the crags.

The Kirghis imagined from this that some of his countrymen were encamped in the pass, and, riding forward, found unmistakeable evidence that horses and other animals had recently passed on the other side of the stream. Presently we came upon three Kirghis, who, after a ride of little more than an hour, brought us to a wide part of the pass, where they had pitched their yourts on some grassy slopes, at a point where the gorge branched off in two directions. The tribe was taking advantage of the rich grass for a day or two before proceeding to the pastures in the Ala-tu.

All the camels, horses, oxen, and sheep had been assembled close about the yourts, as the space on which these had been pitched was so limited by the precipices around. Various were the sounds that greeted my ears on waking the next morning: the sharp cry of the camels and the bellowing of the bulls echoing among the rocks increased the confusion. As day dawned I turned out and stood at the door of the yourt, gazing in silent wonder at the scene before me.

The spot on which I stood was a green grassy mound in the middle of the gorge, and three yourts were placed upon it. A little below, on the bank of a small torrent, there were seven other yourts; while immediately opposite, and at about 300 yards from me, rose up a mighty mass of dark basaltic rocks to a much greater height than the distance from me to them. They were pillared and split into most curious forms—some of them like watch-towers guarding the pass. These rocks divided the gorge, which branched off to the south and east: looking up the southern branch, the eye rested on the snowy crests near the source of the Ac-tu, and up the other were seen the dazzling peaks in which the Bascan has its source, while near me shrubs and flowers were hanging from the clefts, showing that spring was adorning these rugged forms with all her beauty. The whole space around the base of these rocks was filled with living animals, prominent among which I discovered the curved neck and shaggy head of the camel above the horses and oxen, while the goats and sheep were climbing almost inaccessible rocks in search of food.

Two of the sons of my hostess offered to provide horses, and accompany me part of the way, hoping to see our rifles used. I found great difficulty in obtaining a guide; the dangers that lay in the route I purposed taking were so great that the only man who knew the country refused to go with me; but on showing as a reward a flask of gunpowder and a few balls, his eyes sparkled with delight, and his objections vanished. All arrangements for our ascent having been completed, and a party sent back with our horses to the great water-course, we left the Aoul, and turning towards the southern branch of the pass, we rode up to the base of the basaltic cliffs, whence the view down the gorge was savagely grand.

While looking on this scene I could not avoid contrasting the puny efforts of man with these stupendous works of nature. How marvellously small the pyramids and temples of the Egyptians, and the great works of the Romans, would appear if placed at the foot of these towers of basalt; or near the shelving masses of trap, forming mighty stairs leading into the great recesses of the mountains, which in some parts are riven asunder, and horrible chasms seem to penetrate far towards their centre!

Our little band consisted of the two young chiefs, the old guide, three Kirghis, myself, and my two men.

After riding two hours, sometimes between high precipices, at others rocky slopes, we arrived at a part of the pass so abrupt that we could not ascend on horseback. Even on foot, we found it no easy matter to scramble up. At last we reached a small level space, about twenty yards in length and four in width, when a scene lay before us that few could look down upon without a shudder. We were standing on the brink of a precipice, and looking into a fearful chasm, into which no man could descend. The rocks were of dark purple slate, with a few shrubs hanging from the clefts; yellow and green moss covered the upper ledges, and at the bottom was a small lake, the water appearing of inky blackness. To the north, crags rose up far above us, while to the south the mountain was so steep that it appeared impossible to find a path in that direction. This, however, was our only chance.

We began our ascent by going in slanting lines, gaining but little at each tack, and turning our horses with great difficulty. As we ascended higher, each turning gave us a deeper view into the terrible abyss, with nothing to stop man or horse should either slip. After extraordinary toil and no little anxiety we reached a part more easy to ascend, over which we rode. In due time we reached the crest of the mountain, when we turned towards the west, and saw that the day was fast declining. The old guide rode by my side, pointing out the peaks and crags near which we were to pass.

I inquired how he became so well acquainted with this wild region, and after a few questions to ascertain whence I came, and finding he had nothing to fear from me, he acknowledged that he once belonged to a strong band of robbers, commanded by a celebrated chief, "Kinsara." This man was the scourge of all the tribes, whom he often plundered, carrying off their horses, camels, men, women and children. His daring acts filled the Kirghis with so much dread that they dared not follow him into the mountains amidst scenes where they believed was the veritable residence of Shaitan.

Our route was along a mountain ridge, sometimes at the base of high igneous crags, at others over parts covered with moss and short grass. Then we came into a labyrinth of rocks, through which it appeared impossible to find our way; but our robber-guide led on without once being at fault. We presently obtained a splendid view of the snowy chain of the Ac-tu stretching to the east and west. Its vast glaciers and high peaks were sparkling like rubies in the setting sun; while beneath, several bold rocky ridges rose out of the haze, and nearer to us a lower chain of mountains and valleys covered with vegetation. This is the region in which the Kirghis find their summer pastures.

A short ride brought us to the bank of a small and rapid stream, which we followed down into the valley, where we found a fine clump of birch and picta trees, under which we took up our lodgings. It was indeed a quiet spot, for not a sound could be heard save the murmuring of the stream and our own voices. Near to our encampment another narrow valley branched off to the southward, running up between high mountains and rugged precipices. At the end of the ravine some high cliffs rose up, and far beyond it one of the highest peaks of the Ac-tu reared his mighty head, on which the last rays of the sun were shining, lighting it up like a crimson beacon, while a gloomy twilight was creeping over us.

The effect was singularly beautiful. Around us luxuriant summer vegetation was growing, intermingled with flowers, blooming in all their glory. As the valley ascended, both flowers and vegetation gradually diminished through every grade, till the moss on the rocks disappeared. Then came a scene of utter desolation, where the effects of the thundering avalanches are palpably visible, the wreck of which cut off the view of the glaciers; while the high peak, clothed in his cold wintry garb, looked inexpressibly ghastly and chilling. Wishing to get a peep at my companions, I walked to a short distance, and beheld the group sitting around our camp fire. As the valley was shrouded in deep gloom, the bright-red flame gave a peculiar character to the scene. Having jotted down a few notes, I joined my companions, when our saddle-cloths were spread on the ground, and very soon all except the sentinel were fast asleep.

Just as day dawned I was awoke by the neighing of one of the horses close to my ear. On looking round I observed the sun's rays had not yet touched the snowy peaks, and all the chain below was enveloped in a grey misty haze. Presently the people were roused and each man attending to his duties; the young chiefs spread their kalats on the grass and offered up their devotions; their example was followed by the other Kirghis and my men, each in his own peculiar way. In a short time we were in our saddles and riding up the valley, which was covered with rich grass and flowers, while shrubs and dwarf-cedars were growing and hanging from the clefts. In parts the precipices rose from 800 to 1000 feet, their summits split into various-shaped turrets and pinnacles. At one point huge buttresses jutted out into the valley, appearing as we approached to close up the ravine and stop all further progress; having passed these, we had a beautiful view of the snowy chain.

Near the source of the Bascan there was one very high peak, which had evidently been conical in form, and this had been torn asunder. One half only was standing; the rent was curved, and the upper part overhanging considerably. No snow could rest on this precipitous face, and the rocks appeared of a dark purple. The snow that had been accumulating on this mountain, probably for thousands of ages, was riven into perpendicular cliffs 700 or 800 feet high, appearing like Pentelic marble. This was a stupendous precipice, but the whole height could not be seen from our position; my impression, however, is, that it cannot be less than 2000 feet.

Having reached a point where the guide changed our route, we turned towards the west, up a narrow and abrupt ravine, by which we were to ascend to the top of the cliffs. Here we had to dismount and lead our horses over places even difficult to pass on foot, and in about an hour we stood on the mountain slope, about 500 yards from the brink of the precipices. We had now ascended to about 1000 feet above the valley, and this small difference in elevation had effected a wonderful change. Instead of fine grass and luxuriant herbage, short mossy turf and stunted plants covered the surface. Among them I found the rhododendron chrysanthemum creeping among the rocks, with its dark shining green leaves and large bunches of beautiful yellow flowers. Even in sheltered situations, this plant never exceeds three feet in height. I have often found it spreading over a large space, and covering the rocks with its evergreen foliage. A dwarf-cedar was also trailing its branches among the masses of granite, extending to the length of fifty paces. The stems and branches were twisted about the rocks, like huge serpents coiling round them.

Our guide now led the way towards the crest of the ridge. After riding more than an hour we left vegetation behind us, and began to pick our slow and toilsome way over a rough and stony region. At length we reached enormous masses of green slate, shooting up into high pinnacles, so smooth and perpendicular that they can never be ascended. Passing round to the southward of these, we came upon a scene of terrible disruption and desolation, where rocks had been uprooted and hurled down into one chaotic mass of a most fearful effect, extending to the brink of a vast rent that had cut the mountain asunder. A terrible convulsion must have taken place here, rending the mountains in twain and forming chasms into which the boldest man cannot look without feelings of dread.

Having spent a short time contemplating this wonderful scene, we left the spot and rode along the edge of the fallen rocks for about two miles. At length we arrived on the brink of the ravine where it descended in a series of deep precipices; beyond this point our horses could not go, and here we had to part with our friends. Before separating we sat down at a little spring and eat our simple dinner—a few small pieces of hard Kirghis cheese washed down by water from the rill. Game is not abundant in this region; during the whole of our ride we had only seen two small herds of argali, and in both instances they were far out of the range of our rifles.

Our guide did not permit us to sit long—he urged our speedy departure, knowing the difficulties we had to encounter. The way was downward in an oblique direction for about 200 paces, after which we turned the steep rocks, clinging as well as we could to the projecting points. Having gained a narrow ledge, extending along the top of a high precipice, the Kirghis led the way till we came to a break in the rocks. Here a part of the precipice had fallen, forming a stony slope both steep and dangerous, with another precipice at its base, where huge masses were over-hanging which appeared ready to topple into the gulf at the slightest touch. We stood for a few minutes looking at this rugged spot with dread, fearing, if we attempted to descend, the stones would give way and carry us into the depths below. As there was no other path, the Kirghis stepped on to the stony track, when all followed. After several slips and some bruises we reached the terrace, which I found ten to fifteen paces wide, and covered with bushes and plants. From this point I could discern the fearful depth beneath us.

We proceeded along the terrace, which descended to the west, narrowing to a mere ledge, forming a most rugged staircase not more than three feet wide, and in some parts even less. This had a very ugly appearance, but by the aid of the bushes we let ourselves down over many fearful places, and reached a steep part covered with fallen rocks, where poplar and birch trees were growing, with numerous shrubs concealing the cavities, and rendering our progress both slow and dangerous. We next came upon another narrow terrace covered with luxuriant vegetation, in some parts reaching above our heads. From the edge of this nearly level space a slope descended to a great depth, so abruptly that it was impossible to find a footing there.

The guide led us along through beds of plants, in which we lost sight of each other. We had not, however, gone far when we discovered a well trodden track made by a large animal, that the Kirghis at once pronounced to be a tiger. Creeping cautiously along, we reached the lair of the beast, where we found evidence that a tiger had recently been, the place being still warm. We followed the animal's track along the terrace about 200 yards, and then found he had turned down into the gorge among rocks and thick bushes, through which we could not penetrate. Leaving his path, we pushed on through the thick vegetation, and came to a point beyond which it seemed almost impossible to proceed. The place was formed by granite rocks nearly perpendicular, with a few bushes growing in the clefts, the mass presenting jutting points, our only aids in overcoming the difficulties of our descent. At length we arrived in safety on another grassy slope, which led us to the brink of the last precipice.

Having reached this place, we stood looking at the wild scene before us. The opposite side of the gorge was equally rugged and abrupt with that we had descended. We beheld stupendous precipices with large trees growing at their base; shrubs and creeping plants were hanging from the fissures, which gave a softer, but a more sublime character to the scene than when viewed from above. At one part a line of stony turrets were standing on this vast wall, receding into hazy distance; in another, a huge mass 700 or 800 feet high was quite isolated from the precipice by a great chasm, having around its base huge trees covered with green and yellow foliage, contrasting beautifully with the red and purple rocks. Beneath these was a slope composed of débris fallen from the cliffs above, now covered with moss of almost every hue, and extending to the bottom of the pass. The ground appeared covered with grass, but the great depth made it look intensely gloomy. Looking up the gorge towards the south, I saw several of the snowy peaks of the Ac-tu gleaming in the sun, while all around us was in deep shade.

Having transferred this scene to my sketch book, we continued our march downward, scrambling over many difficult spots, and reached the bottom to our great delight. Close to the foot of the rocks we found the bed of a torrent, in which a small stream was leaping and bubbling over the large stones heaped up in its channel. Following the stream down this tremendous defile for about half a mile, we saw a track by which the wild animals come down to drink. Proceeding onward, we presently came to a part where the water disappeared among the rocks. The defile here became narrower, while down one of its sides a small waterfall was pouring; its upper part was invisible, but the last leap was from a cliff between 500 and 600 feet high. Soon after bounding over the edge of the rock, the stream was wafted about by the breeze, like fine gauze floating in the air. As it descended lower, the water was dispersed in white spray, which fell upon us as we passed like a Scotch mist, and quickly producing a similar effect.

The gorge became narrower, till we could not see a hundred paces before us. At length it became a mere fissure, in some parts only twenty-two paces wide, in others twenty-five—with precipices varying from 1000 to 1200 feet in height. On one side the rocks were overhanging, on the other receding, having all the appearance of being able to fit into each other, could any power be found to press them together. The bottom was strewn with huge blocks of granite, slate, and jasper, which had been rolled on and rounded by the torrent. Sometimes the water rushes down this place, filling it to the height of thirty-five feet, as clearly shown by the lines on the face of the rocks. At these times no pencil could delineate the impetuosity of the water, or pen describe the thundering of the flood, as it rushes through this fearful chasm.

After proceeding about half a mile, which occupied us an hour, climbing over stones strewn in our path, we emerged from the terrible cleft into an enormous oval-shaped valley, scrambling up the side of a channel cut by the torrent to the depth of sixty feet. On reaching the top of the bank, I found we were on pastures, covered with rich grass and flowers. As our guide recognised the spot, his eyes sparkled with delight,—we were on one of the encamping grounds of Kinsara, and no doubt it recalled to the old man's mind many scenes of festal enjoyment after successful barrantas. He pointed to a place under some precipices on the north-west side as the locality of the Sultan's yourts; farther to the west he indicated the position of the Aoul of his band, and directed our attention right across the valley to a point near the bank of a torrent, as the spot where a party had always been stationed to guard the pass.

We were now in a deep valley about four miles wide and fifteen long, surrounded by mountains varying from five to seven thousand feet in height, from which there appeared to be no outlet. The sun was shining brightly, and we found it intensely hot; still the grass was green, and the flowers blooming beautifully, proving that they received plenty of moisture. So great was the change on leaving the deep and gloomy gorge, and entering into this sunny spot, that it entirely removed a sense of oppression created by the rugged scenes I had passed. Standing for a short time on one of the heaps of stones, which the torrent had piled up, I examined the view around, and clearly perceived that this had once been a mountain lake of vast depth.

Going towards the base of the cliffs on the eastward, I passed several scattered heaps of large rounded blocks of granite, with patches of sand around them, in which I found many broken shells. Had I possessed the necessary implements for excavation, I should no doubt have found perfect ones. On reaching the cliffs I saw large masses of light green slate, washed down from the strata above, which had been thrown up at this point nearly perpendicular. The line was also distinctly visible where the action of the water had smoothed the rocks. Having with much difficulty climbed the precipice about 560 feet, I found great cavities formed by the water, and the slate broken away and rounded. Above this line there were no cavities, and all the rocks were angular and sharp. Thus a line was distinctly marked along the face of the cliffs indicating the water level.

Having descended, I ordered our march to be resumed, when we proceeded over a thick grassy turf, with occasional large patches of sand and pebbles, among which I found several beautiful agates.

Here I again discovered numerous shells, and after digging up a few inches of sand with my dagger found a bed of several kinds. Having gone about three miles, we came upon another deep channel coming from the south-west, in which a rapid stream was running over a rocky bed. The guide led the way up the bank to a point where we could ford without difficulty. Here the stream was about twenty yards wide, and deeper than agreeable, for in one part it was up to our middle and exceedingly cold, proving that it had come from a snowy source at no great distance. Our guide informed me that this river ran into a cavern in the mountain, and that no one dare approach, as Shaitan had his dwelling there.

Just at dark we reached our resting place, where we found a comfortable berth under some overhanging masses of granite, which had been scooped out by water, and here we lost no time in taking our glass of tea with a few scraps of soaked hyran. When darkness spread his mantle over the valley, shutting out of view the mountains to the south, we had nothing to look upon except the riven and serrated cliffs rising above us. These were partly lit up by the flickering light of our fire, giving a spectral appearance to their singular forms. This was the place on which Kinsara had lived, and my guide told me that no one of the band ever dared to disobey his orders, as doing so was certain death. He had acquired unbounded power over the mind of his followers by his bravery. If a desperate attack had to be made against fearful odds, he led the band, and was ever first in the fight, shouting his cry with uplifted battle-axe, and plunging his fiery steed into the thickest of the battle. This gave confidence to his men and was the secret of his success, but the Kirghis thought he was in league with Shaitan, and that no steel could touch him.

At the foot of these rocks many a man had rested before being sold into slavery, often seeing his wives and children divided among his captors. As we sat around our little fire watching the red glare upon the rocks, we were suddenly startled by a vivid flash of lightning which for a moment illumined the whole valley and adjacent mountains with a pale blue light. We were almost blinded, and the next instant left in thick darkness. A heavy roll of thunder now echoed among the mountains on the opposite side of the ridge under which we were encamped, several other flashes followed, all equally grand, but the storm passed along the chain and did not reach us.

The night passed over and the day dawned without our being disturbed, and long before the sun cast his rays into the valley we were up. While tea was preparing I rambled along the base of the cliffs, and found additional indications of this basin having once been a lake. About half a mile to the west of our encampment there were heaps of rounded granite blocks strewn over a sandy shore; also several isolated masses varying from 100 to 300 feet in height, and standing about 60 yards from the cliffs. The sharp angles had all been worn off by water, and the precipices at this part were much undermined, in some places forming recesses 40 and 60 feet deep.

At one place I found a great triangular shaped mass, 130 yards on its sides, and about 450 feet high. This was pierced through by natural arches formed on each face 32 yards wide and of greater height, leaving the upper part standing on three great abutments. The scene was strikingly grand, and while sketching this beautiful object the sun rose, when I beheld part of his crimson orb through one of the natural arches, giving quite a magical effect to the landscape.

We continued our march to the eastward along the base of the cliffs, in some places over patches of sand and broken shells, till we reached a deep circular indentation extending into the mountain about a mile. The bottom was strewn over with blocks of granite, and the precipices rose to an enormous height; some to more than 1000 feet. Crossing this bay we reached the opposite headland, and then beheld the rent in the mountain through which we expected to make our exit and join our friends on the steppe.

After a walk of nearly two hours we came to the bank of the torrent which we forded yesterday, and not far from its entrance into the great ravine. The guide informed me that there were two tracks by which we could cross to the steppe. One was much shorter and down the gorge, but this was most difficult and dangerous; the other was a little way to the east and over the mountains: by this route Kinsam's band always rode their horses. I at once decided to follow the ravine, as it would take me to the cavern so much dreaded by the Kirghis, and into which the torrent plunged. We shortly entered the chasm, which I found was about 120 yards wide, covered with fallen rocks, among which the torrent went leaping and foaming with great fury. Our way was a rough and dangerous one over the fallen rocks, sometimes 200 and 300 feet above the stream, and then descending nearly to the level of the water. At last we reached a spot beyond which to all appearance we could not proceed. We were now a little above the torrent, which was hidden from our view, and close in front of us the rocks rose up like a wall to an enormous height, with their tops riven into pinnacles, some of them leaning so far over the brink as to excite our wonder at their stability. A loud roaring of the water was heard, which induced me to suppose it was rolling over a deep fall.

I was now led on over huge blocks straight towards the base of the cliffs, where I came to some vast masses over which it was impossible to climb. After scrambling round the end of these we entered a cleft formed in the fallen mass, which was almost dark. The old man, however, groped his way on, I followed close at his heels, and our companions were immediately behind me. Having threaded our way through this fissure for about 50 yards, we emerged into daylight, upon a narrow ledge overhanging the torrent. In front a dark jutting precipice almost closed the chasm, rising nearly perpendicular, not less than 1800 feet. A few small bushes were growing in the crevices near the pass, with scattered plants on the upper ledges, and in this Cyclopean mass was the yawning mouth of the cavern swallowing up the river. We stood silent with astonishment watching the torrent rush on into the fearful abyss, producing a sound that created such a feeling of dread, I ceased to wonder that the Kirghis thought Shaitan had his dwelling here.

The mouth of the cavern was formed by a rugged arch about 50 feet wide and 70 feet high: the river entered this opening in a channel cut into the solid rock—it was about 30 feet wide and apparently 10 feet deep. A ledge of rocks about 12 feet wide formed a terrace along the edge of the stream and just above the level of the water. When my astonishment had somewhat subsided, I prepared to explore the cavern by placing my packet of baggage and my rifle on the rocks, and the two Cossacks followed my example. The guide watched these proceedings with great interest, but when he beheld us enter the cavern he was horrified. Having proceeded about twenty paces the noise caused by the falling water was fearful, and a damp, cold, chilling blast met us. From this point the cavern extended both in width and height, but I could form no idea of its dimensions. We cautiously groped our way on in the gloom for about 80 yards from the entrance, when we could see the river bound into a terrific abyss "black as Erebus," while some white vapour came wreathing up, giving the spot a most supernatural appearance.

Few persons could stand on the brink of this gulf without a shudder: the roaring of the water was dreadful as it echoed in the lofty dome. It was impossible to hear a word spoken, nor could this scene be contemplated long: there was something too fearful for the strongest nerves when trying to peer into these horrible depths. We turned away and looked towards the opening through which we had entered: for a short distance the sides and arch were lighted up, but the great space and vast dome were lost in darkness.

On leaving the cavern we passed round the jutting rocks and entered the narrow chasm beyond. Its bed was covered with large and small rounded stones, proving that water had once flowed through this part of the gorge, and I have no doubt it does still during the great storms in the mountains. As we proceeded onward the ravine narrowed into a mere rent with over-hanging rocks, rendering the place dark and gloomy. Through this part our progress was slow and tedious, but in about an hour we came to a place where the gorge divided into two branches, one going towards the north and the other to the north-east. The guide said the latter, which was the widest, did not extend far into the mountains, but I found it a very picturesque ravine. Many flowering shrubs and bushes were growing from the crevices, and a small torrent was rushing down its centre. The high overhanging cliffs at this part of the gorge were dolomite.

We continued our march by the side of the torrent: sometimes it was bridged by huge masses which had been hurled from their beds above; in one place our passage seemed completely stopped, the whole gorge being filled with fallen rocks to the height of 200 feet, over which we found it no easy matter to climb. This mass of débris extended about 500 yards, and had recently fallen, apparent by the shrubs with their withered green leaves strewn over the rocks. We crossed this chaos with much difficulty and no very agreeable sensations, caused by several huge blocks which were hanging on the cliffs as if ready to fall with the slightest shake, and in about an hour arrived at another rent in the mountain. This chasm extended to the westward, down which came a rushing stream hissing and boiling on its course.

From the loud roaring in the great fissure I was certain there was a waterfall at no great distance. The guide could not be induced to enter this dark and gloomy cleft, so one Cossack remained with him, and the other accompanied me into the chasm. It was not more than 50 feet wide, with precipices rising 1000 to 1200 feet above us. Having proceeded about 100 yards, I came to a sudden turn in the cleft where the rocks overhung so much that the sky could not be seen. It was indeed a gloomy twilight and a dismal looking place, in which all objects were but dimly shadowed forth—even the sparkling water, which was dashed into spray as it broke over the rocks, had a most Tartarean appearance. It now required care in stepping over the green and slippery stones, which rendered our progress slow, but the roaring of the fall became louder every few minutes, adding much to the fearful effects of the place.

After groping our way on about 300 yards without getting a gleam of daylight, we entered a wider part of the chasm, and beheld the sun shining on the crags. They were fringed with bushes and plants that were swinging about with the breeze more than 1200 feet over our heads. Looking up at these from the dark and dismal depth, their foliage appeared bathed in glorious light: this, and the glowing sky above, almost made me fancy that I was gazing from the shades of death into Elysium. From this point we hurried onward, and the noise of the waterfall became deafening. Presently we caught a glimpse of white vapour, and in a few minutes we stood before a sheet of falling water, which came bounding from a rocky ledge, 300 feet above us. It fell into a deep basin, out of which it came seething as from a caldron.

Looking upwards, the scene was sublime. Three successive falls were visible, leaping from rock to rock, and flinging their white spray into mid-air. The precipices have been worn by water into pillars and columns, round which the spray and vapour curled in wreaths as the wind wafted them upwards. In front of the middle fall there stood an enormous mass of dark rocks, quite isolated, and from sixty to seventy feet in height. The falling water strikes upon the head of this, and is thrown off in innumerable jets, forming a crystalline crown for the stony monarch of the chasm, while thin sheets of water descend over his sides, clothing him with a liquid garment, through which his gigantic form was indistinctly visible. From behind this mass a cloud of vapour rises which covers the rugged crags above as with a veil gently wafted by the breeze. Still higher there were other falls, but invisible to us, and unfortunately we could discover no part by which it was possible to climb these tremendous precipices.

Here was a fine study for a geologist, the rocks having been riven asunder, and their formation exposed to the depth of 1500 feet. In some places they are nearly perpendicular, in others overhanging masses appear ready to crush the intruder. After retracing my steps, the Kirghis led the way down the gorge.

Our march was now by the side of a roaring torrent, over which we were compelled to pass several times, which could only be accomplished with great difficulty. On one side of the ravine dark, frowning precipices rise up to a great height, from which prodigious buttresses jut out, crowned with huge pinnacles. Facing these are deep recesses in the cliffs, clearly indicating that these enormous masses have been torn asunder by some colossal power. After leaving the waterfall, a walk of an hour brought us to a wider part of the chasm, less abrupt on one side. Farther down I perceived the rocks rose from the edge of the torrent, without a ledge on which to set our feet. To proceed onward down the ravine was impossible, and to climb the rocks before us appeared equally so; but the old man led on to a mass of débris—up this we clambered to a ledge, by which we gradually ascended to the base of some perpendicular rocks rising to a great height. On reaching these, I found some were torn from the precipices, and standing quite isolated; in other parts fissures were rent in their sides, and in one of these we began to scale the towering cliffs.

We had not ascended far when I had proof that the Kirghis was on the right track, for some pieces of wood had been driven into the beds of the rocks, by which to hold on in this perilous path. Our progress was slow and laborious; as each new point was gained we scanned the crags above, to which it seemed almost impossible to climb. At length we reached a grassy ledge about 500 feet above the torrent, whence we could look down and see where the water filled the whole breadth of the gorge. After resting a short time we began toiling our way up in many a zigzag line, often swinging ourselves past jutting rocks by the aid of bushes which we found growing in the clefts. Having reached the base of some rocks, which formed a complete bar to our farther progress, our guide for a moment looked bewildered. He soon, however, discovered that we had taken a wrong track, and quickly descended about fifty feet, and found the right one. We joined him, and then proceeded onward to the foot of some lofty slate crags of a deep red colour, round which we had to creep along a narrow ledge with a perpendicular wall of rocks near 600 feet beneath us. Our little pack and rifles were taken from our shoulders and pushed on before us; and after crawling in this way for about thirty yards, we turned round the rocks and reached a grassy terrace twenty feet wide, greatly comforted with the assurance that we had passed the worst part of the ascent.

Looking down into the dark and yawning chasm with the roaring torrent 1200 feet beneath tried the nerves severely. A little farther down I perceived the chasm became a mere fissure—in one place the upper rocks projecting so far, that a stone dropped from their edge would have struck the opposite precipice before reaching mid-way down. So little had the hand of time affected these masses, that each projection would have fitted into the opposite recess. After resting a short time to breathe, we began our last ascent with fresh vigour. As we turned away, the precipices seemed to unite, forming a most stupendous archway that would have been a fit entrance to the regions of darkness. The path even now was sufficiently abrupt: sometimes we had to climb the cliffs clinging to the bushes, by the aid of which we reached the small terraces that led us upwards.

At length, after much toil, we stood on the summit, having been two hours and forty minutes in making the ascent. What a savage and desolate scene was now before us! To the south, the crest of the mountain rose up riven into lofty crags—enormous rocks were lying at their base, tumbled about and forming a fearful ruin, extending from the brink of the gorge several miles to the westward. To the east were similar confused masses, and the ridge terminated in a lofty peak. The view to the northward was over the vast steppe, but no signs of men or animals were visible. It was a dreary solitude over which the last rays of the sun were fading away. From this point the chasm turned slightly toward the east for about 500 yards, and then it ran in a northerly direction till lost to my view.

After carefully examining the precipices along the whole of our two days' march and during the last ascent, I became fully convinced that this gorge had been formed at once, by a great and terrible earthquake, which rent the mountain asunder, and let out the water of the lake, and this had formed the great water-course across the plain.

Proceeding in a north-westerly direction, and leaving the gorge considerably to our right, we soon gained a grassy turf, among which were growing numerous flowers, some of great beauty, particularly a deep crimson variety, which was trailing its delicate branches along the grass. In little more than an hour we attained a very abrupt part of the mountain, from which we looked down on the last low ridge. This appeared about three miles across, and at a short distance beyond we saw the fire of our companions blazing brightly. From this place the descent was steep, but we proceeded at a good speed, as night was rapidly advancing, and shortly afterwards I was sitting comfortably at our camp, not sorry at having safely concluded an adventurous day's journey of sixteen hours.

T. W. A.

The PRESIDENT.—I am glad, gentlemen, that you have cordially returned thanks to Mr. Atkinson, of whom I may say that he is the only Englishman who has ever approached that great region, a portion of which he has described to-night; I may add, that no Russian, except a few Cossacks, certainly no naturalist and no competent geographer, has ever been over the larger part of these wild tracts of Mongolia and Central Asia. He might well say that geologists must wish to visit these scenes; and, certainly, after many parts of his description, I deeply regret that I am becoming too old to follow his footsteps.

The point to which he calls your attention towards the close of his paper is the remarkable outlet of a large body of water, due as he supposes to an earthquake which caused a rent in the mountains. At what period, he does not attempt to define; he leaves it to future geologists to examine into the nature of the rocks, and determine if they can the character of the rocks and glaciers at the upper end of this deep valley, and to say at what period this rent took place.

Apart from his ability as a water-colour artist Mr. Atkinson is an excellent word-painter; for he so delineates the physical features of a country, that you seem actually to travel through a region which very few of us can ever hope to visit.

The second Paper read was—

2. *Despatch from* Captain Henry Strachey, *Gold Medallist* R.G.S., *respecting the fate of* Adolphe Schlagintweit.

Communicated by the Right Hon. Lord Stanley, M.P., F.R.G.S., Secretary of State for India.

Adolphe Schlagintweit crossed the Para-Lassa Pass from India to Thibet on the 31st May, 1857. The last documentary evidence consists of his letter to Harkishu from Chang-Chenmo of Ladak, dated the 14th June, with a postscript, stating that it was not sent till the 24th of June, and one or two notes, for sundry payments, of the latter date. These documents were brought from Ladak by the Chuprassies who joined Harkishu at Khardong of Garzha on the 20th of July, from whose statements it appears that before they left the moonshee, Mohamed Hasan, had deserted, taking the ponies, some money, and other articles belonging to M. Schlagintweit, but was overtaken, and the property recovered. Harkishu gathered from Captain Montgomerie, F.R.G.S., of the Trigonometrical Survey, and his native doctor, that they were in Ladak during the summer when he had left. From the locality of his last despatch, Chang-Chenmo, it is inferred that he crossed the Turkish waterparting to the east of the Kara-Korum Pass, perhaps to Sugat on the head of the Kara-Kash, and thence followed the route taken by his brothers the previous year towards Kiliam and Khoten. It seems that he had laid in a stock of merchandise to facilitate his journey by trading. From another source, the Bholiyas of Jwar, the information serves to show that he had reached the margin of an inhabited country at the foot of the mountains; left his camp to reconnoitre, and, in his absence, the guide absconded with most of the baggage and cattle towards Yarkand. Being thus left helpless, M. Schlagintweit sent to the Yanadar of Le for assistance in men, cattle, provisions, &c., whether for the purpose of penetrating into Turkistan, or returning to Ladak, remains undetermined. The next accounts are derived from merchant travellers from Ladak, from whom it appears that he had passed the winter of 1857-58 on the border of Khoten, and that on his arrival the provinces of Kashgar and Yarkand were in a disturbed state from one of the periodical invasions of the Turks. It is unlikely that he would remain more than one winter here, or that if still in the locality he would not have opened communication with Ladak and India: probably, therefore, he took the opportunity of the temporary subversion of Chinese authority to enter Khoten or Yarkand. To go far or remain there, he could hardly avoid the notice of the insurgent Turks, who, though contrary to their natural impulse, might, in the actual conjuncture, welcome him as an enemy to the Chinese, and the love of travel and enterprise might prompt M. Schlagintweit to offer himself in that capacity. In either case, when the Chinese got the upper hand, they would first regain possession of their southern frontier towards Ladak, and he would probably retire with the invading Turks through Kashgar into Khokan, with which our relations have been very slight, although wholly amicable, and on the strength of them, he might meet a friendly reception there; on the other hand, the Khokanis are on bad terms with all their neighbours, including the Russians, who are steadily encroaching on their north-west frontier, and this would add to his difficulties in leaving their country again.

The ways out of Khokan are E. to Ili and S.E. to Kashgar, both completely stopped by the Chinese; S. to Badakshan and Cabul, but physically and politically most difficult; S.W. to Samarkand and Bukhara, and W. to Khiva, both probably hostile to Khokan, and certainly so to the British. A European, and especially an English traveller, would find safety there only from Russian protection. Lastly, to the Russian outposts on the N.W. and North Fort Aralsk, near the Aral and Ak-majed on the Sir (Jaxartes), where most probably he has proceeded, as he would then be in the civilised world again. It would be futile to discuss the chances of his ultimate escape, hanging as they do on the caprices of the vilest barbarians of Central Asia.

The President.—You will recollect that the three brothers Schlagintweit proceeded over Thibet and the chains of the Himalaya, Kara-Korum, and Kuen Lun to Khoten, and the descriptions of two of the brothers, Hermann and Robert, have been made known to the Society. The third brother, Adolphe, went to Yarkand, where it was currently reported and generally believed that he had been killed in an affray between the Chinese and the Turcomans.

Reports have indeed since been gathered by our medallist, Captain Henry Strachey, so well known, and he having sent them to the Secretary of State for India, Lord Stanley has been so kind as to communicate them to this Society.

Sir C. Murray.—I have never been able to visit the country so far east, but I can say this with complete confidence, that, from my own experience, however we may differ from Russia politically, if any English traveller falls into the hands of the Russian commanders, I am perfectly convinced that his safety and his honour will be respected in every way; that I can bear my own testimony to from personal experience.

Mr. T. W. Atkinson, F.R.G.S.—I do not take the same gloomy view with regard to the fate of Schlagintweit that many people have entertained. Having had some experience among the tribes in those regions, I can state that a man is of too great a value for them to kill him. It is very rare that such a thing happens; it is under extraordinary circumstances if they resort to murder. Schlagintweit has two or three routes by which he may turn up yet. One is towards the Kirghis steppes and the Jaxartes, and if he comes upon the Russian pickets in that country he is certain to be safe. Another route is towards Persia, and I think he has a great chance of reaching that country and of passing through it.

Sir C. Murray.—The Persians are very hostile to the tribes that he is with.

Mr. Atkinson.—But not to him.

Sir C. Murray.—Not to him, but to the tribes.

Mr. Atkinson.—I can give you an instance of the possibility of his being yet alive. While I was absent I was lost for near eighteen months, and my friends in Siberia gave me up for dead. The gentleman with whom I had left what little property I had there, was about to make application to our minister in St. Petersburg, to know how it was to be disposed of. Fortunately, I returned and claimed it; and so, I think, Schlagintweit may turn up yet.

ADDITIONAL NOTICES.

Letter from Isaac J. Hayes, Esq., to the President, on the Arctic Expedition under the late Dr. E. K. Kane, &c.

To Sir Roderick Impey Murchison, *President of the Royal Geographical Society of London.*

Philadelphia, May 23, 1858.

Sir,—I have learned that at a late meeting of the Royal Geographical Society a discussion arose upon the discoveries made by the American expedition to the Arctic Seas under the command of Dr. E. K. Kane of the U. S. navy.

By one of the London journals which reported the proceedings of the meeting, it appears that Dr. Rink of Copenhagen submitted some remarks touching the correctness of certain observations made by one of the exploring parties (William Morton, and Hans, an Esquimaux hunter) from the brig *Advance*, viz. the geographical position of the lands to the northward of the 80th parallel, and the open water reported to have been seen beyond it.*

The fidelity of Morton is vouched for by Dr. Kane to the extent of his means of knowledge as commander, in circumstances affording peculiar opportunities for ascertainment of character. His material was worked up by Mr. Charles A. Schott, an accomplished assistant of the U. S. Coast Survey Corps. Whatever error is assignable must therefore fall within one of these three descriptions, viz. imperfect instrumental observations, imperfect dead reckoning, and the mean adopted by Dr. Kane between the two.

I do full justice to the candour of Dr. Rink, and his desire to promote the accuracy of geographical records; but since he has announced his conclusions before the distinguished Society over which you presided, and his criticisms attracted the special attention of members so well instructed as yourself, Sir George Back, Captain Collinson, and Dr. Armstrong, it seems to be a duty incumbent upon myself at the earliest moment to invite the renewed interest of your Society in some considerations to which due weight appears not to have been given in the published report of Dr. Rink's remarks and of the discussion to which they led.

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* For Dr. Rink's Paper see "Proceedings" R.G.S., vol. ii., p. 195, &c.; also "Journal" R.G.S., vol. xxviii.—Ed.

The reader of Dr. Kane's narrative cannot fail to have perceived that he carefully guards against the supposition that he claims more for his materials than they deserved at the hands of geographers, and his map is expressly stated to be the result of a mean between Morton's solar observations and his dead reckoning. At the same time each kind of evidence is separately given, so as to enable every one to draw his own conclusions. The reasons which led Dr. Kane to adopt the method of mean position I do not propose here to discuss; but it appears to me obvious that if we reject them, and also the reckoning of Morton, there is nothing left upon which Dr. Rink can have any exception to the latitude assigned, unless he objects to the meridional observations as inaccurately made or reported. I happen to know that before Morton set out he was placed under the instruction of Mr. Sonntag, the astronomer to the expedition, who carefully trained him in the use of the sextant, and who afterwards expressed satisfaction with the skill attained by his pupil. I never heard the astronomer express the least doubt of the observations made by Morton on this special duty, nor were they ever questioned on ship-board to my knowledge. On the contrary, I have good reason to believe that Mr. Sonntag attributed entirely to the scrupulousness of Dr. Kane's caution in so important an affair, that the possibility of error in the use of the instrument was assumed by the latter gentleman in preparing his report for the press. Entertaining these views, I have thought proper, with the aid of Professor A. D. Bache and his assistant Mr. Schott, to consider what will be the effect upon the chart if we confine ourselves to the solar observations alone. At page 388 of vol. ii. of Dr. Kane's work, in Appendix vi., it will be seen that there are three important capes astronomically determined, viz. Capes Jackson, Madison, and Jefferson. At page 384, lat. 80° is given for Cape Madison, but as the same latitude is given for several other capes which are certainly not in the same parallel, it is obvious that a typographical error has escaped notice. At page 388, Cape Jackson is placed at 80° 1′·5″ (astronomically), Cape Madison at 80° 20′ 2″, and Cape Jefferson at 80° 41′ 2″. Beyond the last-mentioned Cape, Morton reports that he travelled northward according to his dead reckoning about 20 miles, which, as appears by the chart, Dr. Kane values as 12 minutes of northing; making for Cape Independence a latitude of 80° 53′ and for Cape Constitution about 80° 56′.

Dr. Rink assigns to Cape Independence the latitude 80° 41′, the same as given to Cape Jefferson by the unmixed solar observations of Morton. Now, it will occur to you that, before Dr. Rink's position can be maintained, Morton's observations must be discredited, which they have not yet been, nor can they properly be before fresh ones shall have been made at the same points. His commander was always reluctant to assume the responsibility of final announcements to the scientific world unless the data had been collected within reach of his own use of the ordinary means of correction of error; and it was therefore natural for him to endeavour to make all of Morton's estimates of position concur as far as practicable to the determination of the truth. I ought to add, that several persons familiar with the making and calculating of solar observations have expressed the opinion that, if any inference can be drawn from the face of Morton's report, it will be that his results are in defect and not in excess of latitude. This may have been one of the many considerations which induced Dr. Kane to use all the material for a mean. It may prove that in this way a very slight additional northing has been made; but this cannot be now assumed to be as great as it would appear by

Dr. Rink's method, and besides, as the elements and process are all fully stated in the printed report of the expedition, no one need be misled.

I say this much in justice to Dr. Kane, and I beg you to believe without any purpose or desire in an unfriendly manner to question the procedure of Dr. Rink, who I hope will see in this letter, if it should come to his notice, only a proof on my own part of the same disposition which he manifests to guard against erroneous apprehension of all the details of so important an expedition. I think he will agree with me, that it would be an excess of requisition to hold Dr. Kane in the strictest scientific sense responsible for an inaccuracy, if it should hereafter be found, upon fresh observations, that a few miles of error appear upon a chart which was constructed from materials obtained with great difficulty, in peculiar circumstances, and which he has published with full notice of all the known sources of possible error.

What is probably of more present importance is the question of the open *Polar Sea*. If we assume that the latitudes of the capes above-mentioned are as suggested by Dr. Rink, then the only consequence will be that the open sea, if it exists, will be so much nearer to us, and of course proportionately easier of access.

You are already familiar with the evidence which inspection of the explorations of Dr. Kane renders probable that during at least a part of the year the Polar Sea is free from ice. The approximate coincidence of the poles of magnetic and frigorific force, the tendency of all isothermal projections in the Arctic regions, the observations of Russian navigators, and of Sir Edward Parry and others, had made it probable, according to established rules of scientific deduction, that, after passing the belt of ice which encloses the circumjacencies of the Pole, there would be found open water during at least a portion of the Arctic summer of every year. To these accumulative proofs, what was added by the report of Dr. Kane? Precisely the kind of evidence that was needed, viz. *positive testimony*. Morton avers that in the high latitude reached by him (and it is of little moment for the present question whether the latitude was 80° 41', 80° 56', or 81° 12') he saw open water with very little ice, although a gale of wind had blown for two days from the north-east; also flocks of birds and two bears. We know that he went beyond any parallel determined by Dr. Kane. Cape Frazer, the highest point reached on the west side of the channel, was determined by my own observation at latitude 79° 42' 9"; and by none of the ship's company, except Morton and Hans, was any open water seen. Is there any reason to distrust the statement of these two persons? In the first place, their report corresponds with the previous proofs and probabilities above briefly cited, which were already in the possession of scientific men: secondly, Morton had always the confidence of his commander, as he has my own, in his veracity as a subordinate observer: thirdly, he brought with him to the ship bear-skins, in attestation of one part of his report,—and it is well known to Arctic navigators that the polar bear is usually found in the neighbourhood of open water: fourthly, the Esquimaux Hans was not capable of entering into any conspiracy to deceive; he was with difficulty understood, except through an interpreter; and upon his return to the brig I learned from him with such aid that he had seen much water, with pieces of ice and many birds. In such circumstances, to *deny* the report of Morton seems to require a scepticism scarcely warranted by the state of the evidence.

You will find various corroborative data in the narrative of his commander. If we assume the greatest intensity of cold is in the neighbourhood of the magnetic pole, then either that degree of cold continues to the Pole, or the increase of temperature is so slow that the freezing-point of sea-water is not passed before reaching the Pole, if the opinion attributed by the press to Dr.

Rink is well founded. But what data are there upon which to assert positively either of these alternatives, or upon which to contradict the positive testimony of the Russians, and of Morton and his companion? What is *known* of the Arctic regions which can warrant an *à priori* conclusion so sure as to justify the impeachment of witnesses otherwise without impeachment? To my own judgment the antecedent probabilities are so great, that if Morton's report were questioned at all, it would be upon the ground that he sought to adjust his account to scientific probability—a supposition which, to those who know the man, would be impossible.

To the enthusiastic reasoner upon Arctic explorations there are many temptations offered by the *literature* of my subject. I beg to refer you to the American Journal of Science, of May, 1858 (vol. xxv.), for an exemplification of the reserve with which I have permitted myself to consider antecedent reports: a copy of that article, which was hastily written at the friendly suggestion of Professor Dana, is herewith mailed to you. I beg your acceptance of it, as an humble, though, in its transmission, most hearty manifestation of personal respect. Through the kind offices of Professor Henry I was enabled to present my views at the Smithsonian Institution. An abstract of my lectures published in the National Intelligencer of Washington is also herewith mailed to you. At the last meeting of the American Association for the Advancement of Science I presented my reasons more at large. I enclose a newspaper report, which, though imperfectly made, will serve to exhibit the aspect in which I have adopted the evidence.

In the interests of science, and especially of the future development of the great Polar problem, which with the aid of my countrymen I hope ere long to solve, may I beg you to present to the Royal Geographical Society such of the foregoing remarks as you may deem pertinent to the discussion upon Dr. Rink's paper?

I have ventured to hope that your interest in the subject will extend so far as to procure your indulgence for this letter.

Believe me, with sincere respect,

Your obedient servant,

Isaac J. Hayes,

Late Surgeon to the American Arctic Expedition,
E. K. Kane, U.S.N., commanding.

PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

SESSION 1858–9.

Eighth Meeting, March 14th, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Major A. C. Cooke*, R.E.; *Captain A. Clarke*, R.E.; *the Rev. F. W. Tremlett; A. L. Fisher*, M.D.; *J. W. Ogle*, M.D.; *and H. W. Willoughby, Esqrs., were presented upon their election.*

ELECTIONS.—*Captain Henry Harris; Robert Baikie, Esq.*, M.D.; *H. Diedrich Jencken, Henry Loch, and Arthur B. Warre, Esqrs., were elected Fellows.*

EXHIBITIONS.—A large nugget of gold, and a model of the largest found in Australia, were exhibited by Professor Tennant, F.R.G.S.

ACCESSIONS.—Among the numerous accessions to the Library and Map Rooms since the last Meeting were:—Page's La Plata; Explorations and Surveys for a Railroad Route from the Mississippi to the Pacific (vols. 5, 6, and 7); Hitchcock's Ichnology of New England; Cave's Algeria; Emory's United States and Mexican Boundary Survey; Sir Macdonald Stephenson's Map of Turkey, showing the railways; Van de Velde's Map of the Holy Land, &c.

The Papers read were:—

1. *Explorations in South Australia.* By MESSRS. BABBAGE, WARBURTON, STUART, and others.

Communicated by the Right Hon. Sir E. BULWER LYTTON, Bart., Her Majesty's Secretary for the Colonies.

THE papers submitted to the Society contain the results of numerous explorations made in Southern Australia during the season of 1858. In order to obtain a general idea of their extent, it will be sufficient to refer to a map inserted at page 194 in Vol. II. of the Proceedings, which contains all that had been discovered up to the close of the preceding year. Not only has the large vacant space corresponding to the western and northern portions of that map been traversed in several directions, but the path of one explorer, Mr. Stuart, has attained even to about lat. 30° 30', long. 137° 30', according to his careful dead reckoning. The horse-shoe bed hitherto ascribed to Lake Torrens, has now given place to a representation of a chain of lakes, between two of which a well-grassed and well-watered country has been found to exist: a communication has been made across it by Major Warburton from the neighbourhood of Mount Serle to the district lying to the north-west of the lakes. But the most important discovery is that of Mr. Stuart, who traced a line of water parting from the division between the above-mentioned lakes, extending as far as he was able to follow it in a north-westerly direction, and having its slopes towards the *interior* of the continent, of a far more grassy and more promising character than those to the seaward.

A large expedition had been started under the charge of Mr. Babbage at a great expense to the colony, but it was hampered by its own weight, and did not attain any very considerable distance, although the country it passed over was thoroughly examined, both to the right and to the left of the line of route, and carefully mapped by its leader. The minor explorations of Mr. Parry to the N.N.W. of Mount Serle, of Corporal Burtt to the W.N.W. of the same place, and of police-trooper Geharty to the N. and N.W. of Streaky Bay, have helped in a considerable degree to fill up the space within the curve of Lake Torrens, or rather of the chain of lakes by which its course is now represented.

The whole of the country that has been explored affords numerous districts capable of supporting sheep. Its character is thus described by Major Warburton at the close of his numerous journeys, during which he traversed the principal part:—

"Most of the country I have visited seems admirably adapted for pastoral occupation. It is one that would be greatly improved by being stocked, the surface would become firmer, and the thin coating of small stones would be just sufficient to prevent rapid evaporation, but not to interfere with the growth of grass, which would soon spring up under sheep. There is no scrub. I saw very few wild dogs, no kangaroos, and no natives. Sheep might be run in flocks of several thousands; and I believe that for every single sheep the country could carry the first year, three might be put upon it the third season. The ground is high, would be dry under foot when made firmer by the treading of sheep, and it is clean for the wool. A little rain would leave plenty of temporary surface water. The water-holes are generally good, and would last all the year if that country were blessed with periodical rain; but it is doubtful whether it is so or not. Then there is an abundant and sure supply of water from the springs. The country generally is very deficient in useful timber, but the reeds and mud would make good huts."

The following extract of a despatch from Governor Sir R. G. Macdonnell to Sir E. B. Lytton shows in a prominent manner the remarkable extent of the discoveries of Mr. Stuart:—

"Unfortunately for Mr. Babbage it became more than ever evident that exploration should precede the mapping of a country, when a private explorer, Mr. John Macdougall Stuart, returned only in September from a very extensive and successful exploring expedition, conducted entirely at the expense of private parties. Mr. Stuart, who had been with Captain Sturt as draughtsman in his second great expedition, and who was accompanied by only one white companion and a black—with five horses, and a scanty supply of provisions, but with a moral courage and hardihood of the highest description—managed literally to describe an immense circle round the contracted movements of Mr. Babbage and his party; having penetrated in a straight line nearly 240 miles to the north-west of Mr. Babbage's camp at the Elizabeth, and having traversed in various routes nearly four degrees of longitude west, and three of latitude north of that position.

"These points will be more evident to you on examining a map which I have caused to be compiled for your information, and which not merely gives Mr. Stuart's track as in the chart attached to the enclosed Council paper, but also shows the position of Mr. Babbage's camp, together with the general aspect of the country in the vicinity of Lake Gairdner, as laid down by Major Warburton, Mr. Babbage, and others. You will thus see at a glance the great extent of Mr. Stuart's discoveries, and the importance of their character, as it seems probable that at least from 12,000 to 18,000 square miles of country, available hereafter for pastoral purposes, have been opened by Mr. Stuart's exertions; and I am glad to say the House of Assembly have presented an address to me, requesting me to take the necessary steps for giving Mr. Stuart a fourteen years' lease of 1500 square miles of the new country, to be rent free for the first seven years.

"I would suggest that the labours and discoveries of Mr. Stuart might with propriety be brought under notice of the Royal Geographical Society, on account of the extreme interest attaching to some of them. I allude more especially to his discovery of the range which I have called Stuart Range, and which appears to have been traced in a N.W. direction; broken more or less here and there, but still forming on the whole a continuous dividing water-parting from along the west shore of Lake Torrens (about lat. 30° 30′, long. 137° 30′) to lat. 28° south and long. 133° east, being the farthest point on Mr. Stuart's map. The fact of the waters flowing from that range to the north-east and north, together with the apparently feasible tale of the natives of large bodies of water existing still farther to the north and north-west, as well as the improved country generally existing at the north side of that range, contrasted as it is with the extremely barren and desert country south of it towards Lake Gairdner and the sea—to which region the journeys of former explorers were principally confined—all form a strong body of evidence tending to invest the hitherto supposed interior desert of Australia with a character at once novel, important, and interesting.

"At the same time, whilst admitting the great results attained by Mr. Stuart with comparatively insignificant means, but by the exertion of a courage, energy, and judgment scarcely paralleled in the previous history of Australian explorations, it is necessary to bear in mind that the chart of his track has been constructed with the aid only of a compass, and the dead reckoning which he kept. Under such circumstances I shall not be surprised to learn hereafter that his distances are over-stated, as is so often the case when travellers rely entirely on dead reckoning. Nevertheless, although there may be considerable room for improvement of his chart in this respect, it will under all circumstances be a great monument of what can be achieved by the indomitable pluck of one man, imbued with a thorough spirit of self-reliance."

The PRESIDENT.—We return our thanks to the Secretary of the Colonies for sending to us these voluminous and interesting communications, and also to the gallant explorers of these hitherto unknown tracts of South Australia. The gentleman who in the first instance most distinguished himself in these researches, and to whose merits I adverted last session, is Mr. Herschel Babbage, who had undertaken his journey with a fair prospect of success. He had zealously prepared all the requisites to enable him to get through the southern saline district from Port Augusta, and I give him credit for the enterprise, zeal, and talent he exhibited in getting out of a most difficult position. No sooner was he free of his heavy drays, than, taking to horses, he went forward to the north, and fixed with more accuracy than any other person the latitude and longitude of various places, giving us a clear account of the chief fresh springs, the nature of the rocks, and of the natural productions of the country, and delineating the form of the saline sheet of water named by him Lake Gregory as separated from Lake Torrens. It was when he reached his northernmost point on Lake Gregory that he was recalled, Major Warburton taking the command of the expedition. All that tract of country which extends 100 miles inland has now been determined, first by the discoveries of Mr. Babbage, and secondly by those of Major Warburton and others; and the results quite coincide with the original observations of that most adventurous traveller Eyre, in proving that all this zone is more or less saline. This salt country has been crossed by that remarkable man, Macdougall Stuart, who beyond it explored a vast fertile and well-watered region, with a great many watercourses descending from a chain of hills, to which the Governor of the colony has very properly assigned the name of the "Stuart Range." This new geographical discovery is indeed one which we might have expected from the former observations of that most distinguished explorer of Australia who now sits on my left hand, Captain Sturt. This gentleman, let me remind you, was truly the discoverer of South Australia. It was he who, advancing from the north-east, discovered the course and embouchure of the Murray River, and who indicated what South Australia was likely to become. Revisiting that tract at a later period, and after a colony had been established there under the government of Sir George Grey, Captain Sturt went boldly northward into the interior—much farther than any traveller who preceded him or has followed him—his progress being arrested by that great saline desert. Now Mr. Macdougall Stuart was one of Sturt's men, and learned from him that, whilst all was saline to the north, yet that probably towards the north-west there would be found a fertile country—a conclusion partly based on the flight of birds from that quarter.

Captain Sturt has come this day from Cheltenham to attend our meeting, and I rejoice to welcome him; whilst I am peculiarly gratified to see amongst us the Bishop of Perth in Western Australia, who has just arrived from that colony, and who previously to his becoming a dignitary of the Church was for some years at the head of an educational establishment in Western Australia.

CAPTAIN STURT, F.R.G.S.—You may suppose that I have read with very great interest the different accounts which have been recently sent home with regard to the discoveries in South Australia, more particularly that which refers to my old follower Macdougall Stuart, of whose courage and perseverance I was well assured. He attended me on my second attempt to cross the stony desert; and it was on that occasion that he and his companion expressed their readiness to follow me wherever I should lead them, when (after having been two days and a half without water, our farther advance into the desert would almost inevitably have cost us our lives) I left it to them to decide whether to push on or not—"Sir," said Stuart to me, "we will do as you please; we will go on or turn back as you may direct us," thus showing their devotion to the service on which they were employed. I turned back, however, and in doing so gave up every hope of further success. I may state that in retreating we lost three horses, and that on arriving at the little waterhole we had last quitted (on which I had calculated for relief), we found it had dried up!

The effect of such a discovery may be imagined, where life or death hung on our procuring water. We had not at that time seen a living animal of any kind in those fearful solitudes for days, but suddenly a pigeon passed us, and pitched for a moment only on the stony plain beyond us. Knowing from his flight that he was going to water, we went to the spot, and there found a supply of it that lasted us for two days, and which we should never have discovered but for the timely appearance of this bird. This was one of the many instances we had on that journey of the goodness of Providence, which can only be appreciated by those who have been placed in similar circumstances. So unexpected a deliverance melted my companions into tears. The kind of country which Stuart has discovered in his recent journey, and which he describes, is similar to some portions of that which I passed over myself, particularly near Cooper Creek, where there are slightly elevated ironstone ranges, with a certain portion of good land on each side of the creek which flows between the ranges, and which gives a value to this locality as to that which Stuart has discovered.

In reference to Mr. Babbage's journey, I have been much surprised at the altitude he gives to the lakes which he discovered, because I take the interior to be much lower. At my depôt, whence I started into the interior, and which was only 340 feet above the sea-level, I descended very considerably as I neared the great stony desert, which I consider to be the lowest part of Central Australia, since the rivers, so far as I could judge, fall into it both from the south and from the north, and appear to meet in it as a central channel, for the main channel of Cooper Creek on the one side, and Eyre Creek on the other, certainly do run into it; but Mr. Gregory having traced the western arm of Cooper Creek (which, after overflowing a large plain, reforms as my Strzelecki Creek) into Lake Torrens, I have now no doubt but that the other creeks which I crossed, equally owing their existence to that arm of Cooper Creek, water the country immediately to the north of the lately-discovered lakes, and ultimately flow into them.

I think the most important part of Stuart's discoveries, independently of the available country which he has opened out, is the key which his large creek opens to the farther penetration of Central Australia. If the ranges he mentions continue to the north-west, as we have every reason to hope, water may be found near them, so as to enable explorers to go farther into the interior with every prospect of success from so advanced a position. Stuart, at his farthest point, was 700 miles from the position which I occupied in the centre, in lat. 24° and long. 138°. Mr. Gregory, at his farthest distance south from the Victoria of Stokes, was 4° of latitude higher to the north and 11° of longitude farther to the west than I was, and, therefore, he was about 700 miles to the west-north-west of my central position. At that point the country was exactly the same as the country which I had traversed—the same kind of sand-ridges and the same kind of vegetation: but there was this remarkable difference in the two localities, that where Mr. Gregory was, the sand-ridges ran east and west; and where I was, they ran north and south. How far the same kind of country may continue to the westward of his point, which would be nearly due north of Stuart's farthest point, and about 700 miles distant (our positions thus forming an equilateral triangle), it is impossible to say. I still believe that there is a large basin of water in the interior, and that there may be a good country yet found round about it. A black, who came to our depôt, certainly described water and fish as being to the west of us in so energetic a manner that we were all convinced there must be a mass of water in the direction to which he pointed. The motions he made and the indications which he gave naturally led every one of us to believe and to hope that we were within 50 or 60 miles of an inland sea. I believe now, when the country is farther explored, that the central channel will be found to lead into or be connected with some large basin of water.

The President (addressing Captain Sturt).—How far from west to east do you suppose the region containing fresh water may extend?

Captain Sturt.—I should say it would run to the meridian of 138°.

The President.—I apprehend that Captain Sturt does not wish you to infer that any part of the region between his farthest north and Gregory's farthest south when he proceeded from Tropical Australia can be occupied by fresh water lakes, rivers, or springs.

Captain Sturt.—No, no.

The President.—You see, gentlemen, that all that low region is considered by Captain Sturt to be sterile.

Captain Sturt.—That must necessarily be a dry and barren country. It is to the westward altogether that my observations point—*to the great western half* *of the unexplored portion of the country*; and my view is rendered still further probable by the flights of fowls which Stuart mentions as going to the westward over his head.

MR. TRELAWNY SAUNDERS.—The discovery of the interval between Lake Torrens and Lake Gregory should teach us to beware of assuming, from a similarity of country at distant points, that the intervening space presents a continuation of the same nature. But for a deduction of this kind, the discoveries of Babbage and Stuart on the west of Lake Torrens might have been forestalled by Eyre nearly 20 years ago. In penetrating at that time into the country at the head of Spencer Gulf, Mr. Eyre found his course stopped at four different points by the impenetrable basin of a salt lake; and having been thus repeatedly obstructed by identical features at no great distance apart, he concluded that these features were continuous. Consequently a long lake of horseshoe shape has ever since invariably appeared on maps under the name of Lake Torrens. Mr. Herschel Babbage has, however, now discovered a tract of practicable country extending nearly the whole distance between two of the points reached by Mr. Eyre; so that the length of Lake Torrens has to be curtailed, and a separate basin has to be recognised under the name of Lake Gregory. Into Lake Gregory falls a permanent stream containing fish, and some others which Mr. Macdougall Stuart discovered during the admirable exploration which he has just accomplished with such remarkable success. A well-watered country was therefore opened to Eyre's research, if he had steadily persisted in tracing the limits of the muddy barrier which had barred his progress three times in this direction, instead of trusting to a tempting generalization.

The mode of argument which led to the horseshoe extension so long attributed to Lake Torrens, on the basis of four distinct observations not very wide apart, is now proposed to be adopted in the following case—one of equal or greater importance. Captain Sturt was stopped by desert at the northernmost point of his famous expedition into the interior from the south. Augustus Gregory also found a similar desert at the southernmost point of his recent journey from the mouth of the Victoria. Therefore it is supposed that the interval of about 700 miles is also desert. It must be kept in mind, however, that a few ranges of no greater height than that discovered by Stuart, and named after him, would probably suffice to attract and retain the moisture which the arid air of a stony or sandy plain might absorb before it could descend to moisten the parched ground. Such ranges would render the connection between the north and south coasts practicable; and Stuart has indicated the extension northward and westward of those which he has lately made known, while it may be considered highly probable that similar features, like the Stanley and Grey ranges, exist between the waters terminating in Cooper Creek and the Gulf of Carpentaria.

MR. JOHN CRAWFURD, F.R.G.S.—I have been charged here more than once with being a kind of objector-general; to-night I have not a word to say in the shape of objection. I approve of the conduct of all the gentlemen who make these most important discoveries; the greatest praise is due to all of them. They have conferred great obligations upon the colony itself, obligations upon us who have been listening to what they have done, and obligations upon the country at large. They are true Englishmen, countrymen of the discoverers of the steam-engine, the locomotive, the electric telegraph, and of the only people who could have performed the feats they have done. Captain Sturt, now here, but with whom I have not the good fortune to be acquainted, is, according to my judgment, the greatest of all Australian discoverers. We are heartily obliged to him for coming up here in his rather delicate state of health: at the same time I am sorry to see him here, for another reason, that he ought to be employed in some high office elsewhere, as, for example, governor of South Australia or of Victoria, or some equally-important office, for he is assuredly most eminently qualified. I have in my time read several books on Australia, and fear I have forgotten most of them. Not so those of Captain Sturt, which no one that has perused them can ever forget, for they make truth more interesting than fiction.

THE PRESIDENT.—These despatches are full of interesting anecdotes, which, when published, will be read with great interest.

(Here the President read two passages; one regarding the natives, another describing the habits of the emu.)

CAPTAIN STURT.—I quite agree with our worthy President that such is the case. The features of the country are such as to lead to that conclusion. I cannot but think that the desert extended for hundreds of miles beyond where I was at my extreme north. Its features were altogether on too large a scale for me to suppose that they would speedily terminate or change, for notwithstanding that the distance between Mr. Gregory's position and my own is so great as 700 miles, not only is the character of the country the same at both points, but the vegetation is precisely the same also. Probably a better country than either I or Gregory found, exists in the *central portion of the great western half of the continent*, which has never yet been approached. I was in great hopes that Mr. Gregory would have found that Sturt Creek, the creek he traced south, either ran farther to the south, or that it terminated in a basin; but he found that, like all the central rivers of Australia, falling into a level interior, it gradually lost its current, then assumed a chain of ponds, and was ultimately lost by evaporation and absorption. Such is the general fate of all the inland waters of the continent; for which reason there is so much difficulty in making sure of a supply of water in it. When I went into the interior I never allowed my party to go on until I had made a day's journey in advance and found water. Yet with all this caution I was cut off from the possibility of a retreat at the depôt, where I was locked up for six months, and saw the water diminish day by day, from twelve feet to eleven inches, when in ten days more, if rain had not fallen, there would not have been a man of us alive; fortunately, however, a fall of rain came from the north-east, as in Stuart's case, like a dense fog, and in less than twenty-four hours filled the creek to overflowing, which it had taken six months to exhaust. This drizzling rain lasted two days, and it was on the surface-water left by it that I ventured to push on farther into the interior, drinking from shallow puddles that the wind made as thick as mud, and sometimes water that was perfectly loathsome.

PROFESSOR OWEN.—I would ask your permission to say a *few* words, because I am in hopes that they may help a little towards increasing our knowledge of the peculiar animals, especially the quadrupeds, which inhabit the continent of Australia, respecting which we have just heard such new and interesting information. By me, of course, the narrative of the remarkable geographical discoveries in South Australia has been listened to chiefly in anticipation of novel facts in zoology, and I will not disguise my disappointment at hearing mention made of only one small kangaroo-mouse. But your estimable President has consoled me by intimating that the papers of Mr. Macdougall Stuart contain a few other observations upon natural history subjects. And yet one ought not to be surprised to hear so little about the native quadrupeds from an Australian traveller, who was not expressly bent on zoological collections.

All the marsupial quadrupeds, and it is one of their curious peculiarities, are nocturnal. Even the kangaroo, which is the least so, is scarcely ever seen feeding out on the plains in broad daylight; it prefers the early morning dawn or the short twilight, and, above all, the bright moonlight nights. With regard to most of the other Australian forms of marsupial animals, they are more strictly nocturnal. So that, if a traveller were not aware of that peculiarity, he might fancy himself traversing a country destitute of the mammalian grade of animal life. If, however, after a weary day's journey he could be awakened, and were to look out upon the moonlit glade or scrub, or if he were to set traps by night, he would probably be surprised to find how great a number of interesting forms of mammalian animals were to be met with in places where there was not the slightest appearance of them in the day-time.

It is most interesting, with regard to the very peculiar characteristics of the prevalent mammalian forms in this enormous continent, to look back into times past—of untold antiquity—and to find, from the evidences that have been lately coming over rapidly, of the fossil remains of mammalian animals that are obtained from formations in Australia of the same general character and geological age as those brick-fields and other lacustrine deposits in our own country, where our old elephants, rhinoceroses, hippopotami, and other large quadrupeds are found; to find, I say, that in Australia there are evidences of creatures of equal bulk, but of marsupial nature, which have also passed away and become extinct. We can now show in the British Museum, for example, the fossil skull of a kangaroo—that is to say, of an animal with the peculiar cranial structure and dentition of the genus *Macropus*—tooth for tooth, in kind, in shape, in number and position, like no other creature but a kangaroo; and yet this fossil cranium is more than three feet in length. The governor of New South Wales, Sir William Denison, has transmitted, and through your excellent President has distributed to those who can best appreciate the evidences afforded by a happy application of the photographic art, excellent photographs of other singular fossils that have lately been discovered in Darling Downs in Australia. Those evidences have brought to our knowledge the skull of a quadruped not so large as the one I have referred to, but the most extraordinary in its proportions and characters that the palæontologist has ever before seen, and which, in reference to its affinities, finds its nearest analogue in that rare marsupial animal called the koala. The *Nototherium* was as gigantic, in reference to that recent marsupial, as the Diprotodon with a head three feet long is to the existing kangaroo. These great herbivorous marsupials were preyed upon by an equally marsupial carnivore of the size of a lion. Thus we learn that *marsupialia* enjoyed existence in Australia in times long past, and under forms as gigantic and remarkable as those Placentalia discovered in the European and Asiatic continents, which have revealed the former existence there of hairy elephants and rhinoceroses, of huge deer and bisons, of bears and hyænas, illustrating the same geographical restriction of certain mammalian forms in the pre-historic and present times.

In regard to the relation of marsupial quadrupeds to Australia, the adaptation of their peculiar characteristic to that country has been impressed upon me to-night more than on any other occasion, while listening to the graphic and thrilling account of the difficulties which the highest form of mammalian life finds in maintaining his existence in that continent, in consequence of the great scarcity of water. I have always connected with the long droughts in Australia, with the extensive tracts where there are no waters, with the difficulty of obtaining that necessary element of life,—the singular peculiarity of organisation which prevails among the mammalian quadrupeds of Australia. The carnivorous species and the insectivorous ones, the frugivorous; the root-eating and the leaf-eating quadrupeds—no matter what their diet, whatever be their powers of locomotion and spheres of action; whether they burrow like the wombat, climb like the phalanger, jump like the kangaroo, trot like the bandicoot, or fly like the petaurist,—no matter what their mode of motion or kind of food,—all these creatures are marsupial. I may be asked, What do you mean by marsupial? I mean that they are creatures having the power of carrying their delicate prematurely-born young about with them wherever they go. They have this condition, viz., a soft, warm, well-lined portable nursery-pocket or "perambulator." Take the case of one of our wild quadrupeds, suppose a fox or wild cat; they make their nest, they have their litter. Suppose it should happen that they must travel one or two hundred miles to get a drink of water, impelled by the peculiar thirsty condition of a nursing-mother, but obliged to leave the little family at home,—where would that family be when the parent returned from its hundred miles journey, the poor, little, blind, deserted litter? Why, starved to death. In order that quadrupeds should be fitted to exist in a great continent like Australia, where the meteoric conditions are such as to produce the dilemma I have instanced, those quadrupeds must possess an organisation suited to such peculiar climatal conditions. And so it is; that form of mammalian quadruped in this great continent, native to it, and born so as to make these migrations to obtain that necessity of life, has the superadded pouch and genetic peculiarities enabling them to carry their young ones wherever they go. And since we find that marsupial animals have lived in Australia from a very remote period, so we may infer that its peculiar climate has prevailed during as vast a lapse of time. Permit me to conclude by repeating that the peculiar mammalian forms of Australia hide themselves by day, and must be sought for by night, or early dawn, or twilight. The scientific traveller, bearing in mind that the marsupialia are nocturnal and keep out of view, would do well to let no night pass without setting and baiting traps for them. He would probably thus be able greatly to enrich our catalogues of these most curious and interesting quadrupeds.

The Second Paper read was:—

2. *Notes on the Manacusi, or River King George.* By CHARLES H. HILLIARD, Mate of the Cutter *Herald.* 1857.

Communicated by J. LYONS M'LEOD, Esq., F.R.G.S., late H. M. Consul at Mozambique.

THE *Herald* sailed on a trading expedition up the Manacusi River. When she had attained a distance of from 100 to 140 miles from its mouth, the Portuguese authorities forbad farther progress, and the vessel was ordered to return. Mr. Hilliard gives an account of what was observed during the three weeks the *Herald* was in the river. The bar at its mouth is described as the scene of a fearful surf, dangerous to a boat, but offering no difficulty to the vessel:—

"Opposite to the passage by which we entered are several large, low islands, densely covered with the finest red mangrove poles I ever saw, on which the archil grows in great abundance, and on the bush by the banks of the river. For some miles up the river the banks are more or less covered with bush, mangrove jungles, and trees, generally a species of banian, and others, indicating a wet soil, the most of which I have seen growing in swamps in Natal. On the first night, by where we anchored, the large bush-buck (Inconcha) appeared to be plentiful from the number we heard barking like small dogs.

"On the west side of the river a ridge of high land, apparently continuous, but very irregular in its direction and elevation, extended the whole length of our journey; at a few points it approached the river, but generally a flat, marshy tract of country, many miles in width, and densely covered with a coarse kind of Guinea-grass five or six feet high, lay between it and the river; on the opposite side flats of the same description reached from the river to the sea, and from the highest point we reached they were only bounded to the northward by the horizon. The lower part of the river, as far as we felt the influence of the tide, was of good width, and much more straight than it was farther up, the banks in its whole length generally fringed with a thick border of tall reeds a few yards in width. The banks here were frequently studded with trees or small patches of wood, the trees of the same kinds as those near the mouth of the river; and two of our party having landed in one of them, in pursuit of some guinea-fowls, were soon glad to retreat, as they found no ground to walk on, but were half way up their legs in soft clayey mud. Near the head of the tide-water the river became narrower, but continued the same uniform depth the whole distance we traversed, having from 6 feet to 9 feet by the banks, and from two to three fathoms in the channel; only one shallow spot was found in the whole distance (from 100 to 140 miles), where the water suddenly shoaled to 6 feet, and we frequently shaved the banks so close that our little craft brushed the reeds down with her mainsail, with plenty of water under foot. For many miles of the upper part of our journey it was wholly without wood, except here and there a straggling fig-tree, generally on the edge of the bank, and bent over the river by the force of the south-easterly winds (several times much to our annoyance), and all of them destitute of branches on the weather side, and appearing as if swept down by a hurricane, from the effects of which they had never recovered.

"We landed several times with the idea of searching for game, but, wherever the grass had not been burnt we found it impossible to penetrate it even for a few yards, and in most parts of it a buffalo might have been started within 3 yards of a person without his being able to see the animal. The course of the river is one of the most serpentine that can well be imagined, and I believe that in passing its interminable bends we headed to almost every point of the compass; but the same uniform depth and monotonous appearance throughout, and our view generally bounded on all sides by a wall of tall reeds and grass, from which myriads of musquitoes issued and tormented us all night."

The banks of the river were found in some places to be honeycombed with pitfalls for hippopotami and other animals. There were large numbers and many varieties of birds, but only one kind of fish, and that was a species of barbel, which occasionally attained a great size. The natives caught them and sold them in bundles, split, skewered open, and dried in the smoke.

In adjourning the meeting, the President said that he must remark that the communications made to this meeting, and the observations which had been made on them, had given him as much satisfaction as he had ever experienced on any former occasion since he had occupied the chair. He then reminded the assembly that he had directed cards to be sent to every Fellow of the Society, inviting them to soirées on the 16th and 30th of March; and that if any Fellow had, through accident, not received the card, he hoped that the omission would be overlooked.

Ninth Meeting, March 28th, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Captain L. S. Tindal*, R.N.; *Captain H. Harris; Captain John Walker; H. D. Jencken; David Kay; and Thomas Phinn*, Q.C., *Esqrs.; were presented upon their election.*

ELECTIONS.—*Colonel Henry F. Ainslie; Lieut.-Colonel A. Lane Fox; the Rev. G. Croke Rowden; L. P. Delves Broughton; John H. Gurney*, M.P.; *C. H. Rogers Harrison; and C. Orby Wombwell, Esqrs.; were elected Fellows.*

EXHIBITIONS.—Several Chinese Maps and Drawings of the Yang-tse-Keang, and a magnetic variation Chart of the World, by F. J. Evans, Esq., R.N., F.R.G.S., were exhibited.

The Papers read were:—

1. *Notes of a Voyage up the Yang-tse-Keang, from Wosung to Han-Kow.* By LAURENCE OLIPHANT, Esq., F.R.G.S., Secretary to the Earl of Elgin. *With a Chart of the River*; by CAPT. SHERARD OSBORN, R.N., C.B., F.R.G.S., in command of Her Majesty's Ship *Furious*.

THE squadron consisted of the *Retribution*, *Cruiser*, and *Furious*, with the gunboats *Dove* and *Lee*, and started from near Shanghae on Nov. 9th, 1858. The *Retribution* was found to draw too much water, and was ultimately left 90 miles above Nankin; the remaining vessels attained to the far-famed Chinese mart Han-Kow, which is upwards of 500 miles from the mouth of the river. Immediately on commencing the voyage, extraordinary changes in the soundings of the river, since the time of Collinson's survey, became manifest—shoals had been converted into islands, and spots formerly avoided as dangerous were now in the course of the deep and safe channel. There were numerous delays from groundings, especially at the outset, but all dangers from first to last were surmounted without accident. Many forts, usually of a small size, had to be passed in the course of the expedition, those in the district adjacent to Nankin being in the hands of the rebels. They frequently opened fire upon the squadron during its upward voyage, but in no case was any damage sustained worth speaking of, and all attacks were speedily silenced. With these isolated exceptions, the reception of the squadron was sufficiently friendly. The character of the river banks is described minutely and with great detail in the paper: it is very varied; all kinds of scenery appear to alternate. In some parts it is level and monotonous, in others highly picturesque and rocky. The river is often filled with islands, and in all places it shows signs of great alterations of level. The well-known province of Lakes, with the waters of most of which the river is connected, appeared truly remarkable for its extent. There was not much sign of life along the river. The cities were sadly desolated by civil war. Han-Kow was the only place visited that had any pretension to commercial activity. There is no other spot in the empire more suited than it to be the centre whence foreign trade might radiate. But "although there was every appearance of a denser population (in its neighbourhood) than had characterised many sections of the lower portion of the river, we were not impressed with the idea either of the fertility of the soil or the wealth and abundance of the inhabitants, which the meagre accounts that had previously reached us led us to form. The peasantry, where the country is not harassed by civil war, are contented and comfortable; but there is a total absence of anything like a display of wealth or luxury either in the towns or country. It is difficult to judge of the trading capabilities of a country so internally convulsed as China is at this juncture, but there seems a great danger of overestimating them. Even between the Poyang Lake and Han-Kow, where the river is perfectly free from rebels, hardly any trading junks are to be seen; and until we reach the latter city there is no spot at which any considerable head of population is collected, or any indication of an extensive internal traffic apparent."

The mode in which European commerce appears likely to find its way up the river is by means of small river vessels starting from

Shanghae, and it remains to be seen whether or no the inexpensive but slow Chinese junk will hold its own in competition against river steamers. No chart will supply the requirements of a navigation of the river, for the remarkable and rapid changes in its bed defy all such facilities. It is only by a succession of native pilots—one for every 80 or 90 miles—that it is ever likely to be ascended with speed and safety. When the expeditionary squadron returned great changes in the hydrography of the river had already become apparent. All the vessels had safely arrived in the neighbourhood of Shanghae by the middle of January, 1859.

The PRESIDENT.—In asking you, gentlemen, to return thanks to Mr. Oliphant, Captain Sherard Osborn, and the officers of Lord Elgin's expedition, who prepared the excellent chart now before us, I may state that this valuable communication contains a variety of illustrations of the state of the country since the rebels have taken possession of large portions of it, which the Secretary has not had time to read. I am persuaded that when you peruse this memoir in our Journal you will render every justice to Mr. Oliphant, not merely for his description of the physical geography of the country, but also for giving you an exact picture of the impoverished condition of very large tracts which were formerly in a very flourishing state. Fortunately, on this occasion a gentleman is present who has known the river and has visited the different stations on it when the whole population was in a most prosperous condition. This is Sir John Davis, whose paper is announced as second upon the list. He will give you a description of the interior of China as it was before the rebellion, as contrasted with the present miserable state of every tract which has been invaded by the rebels.

The Second Paper read was—

2. *View of the Great Valley of the Yang-tse-Keang before and since its occupation by the Rebels.* By SIR J. F. DAVIS, BART., K.C.B., F.R.G.S.

SIR JOHN DAVIS observed that, had not the recent expedition of Lord Elgin up the great river of China rendered such farther details superfluous, he might have occupied the time of the meeting with more of his own personal experiences on that river, as high as the Poyang Lake, within no great distance of Han-Kow, the present *ultima Thule* of English investigation. But, after the interesting memoir just read, he should confine himself to a brief view of the high state of prosperity, population, and trade existing at the time of his own visit as contrasted with the utter desolation since perpetrated by the rebels; and the abundant depth of water in 1816 as compared with the low ebb of the river, which had formed the chief impediment to the progress of our steamers in 1858. They had been about eleven days from Golden Island to the Poyang Lake, and this, for them, was justly considered as slow work; but what was it compared with the twenty-six days which were occupied in the same transit by the clumsy Chinese boats in which he had journeyed against the full stream and a generally contrary wind? This delay, however, gave ample time for inland excursions and observation, to which the Chinese, after a time, made no opposition. The high, sandy, and barren nature of the banks, remarked on by the late expedition, was a disadvantage resulting from the low state of the river; while the aspect of the country on the previous occasion, as viewed from the surface of the greatly-raised waters (estimated by some at 40 to 50 feet), gave a much more favourable impression of the region. In fact, his companion, the late Sir Henry Ellis, justly remarked that, however absurd the pretensions of the Emperor of China to universal supremacy, he certainly possessed the most magnificent territory, within an imperial ring-fence, in the world.

The enormous estimates of population, as given by Du Halde and M. Huc, for the central position of Han-Kow and the two adjoining towns, were manifestly exaggerated; but, if taken at less than *half* the amount, they proved the value of the position as a commercial mart. It was not so easy to over-estimate the amount of desolation caused by the rebels in those rich and populous districts. But Lord Elgin's suite had observed the rapid restorations already effected since the retirement of the barbarous hordes. Any one who had witnessed the celerity with which the indomitable industry of the Chinese has repaired the effects of a conflagration in a large town, might feel sanguine as to the speedy revival of commerce and population, as soon as there was renewed safety to property and person. The Keang would soon again be covered by the Chinaman's argosies:—

> "Mox reficit rates
> Quassas, indocilis pauperiem pati."

Indeed, a well-known couplet of our own poet might (with slight variation) be applied to the Chinese:—

> "You break his web of *industry* in vain,
> The creature's at his *busy* work again."

It is impossible to anticipate any other than the best results from this well-timed expedition of Lord Elgin. It seems to have tested with success the good intentions of the Peking Government, if we may judge by the conduct of their representative, the Viceroy of Hukwang. But if it had produced no other result than to establish a proper understanding with the insurgents, and show them the folly of aggressive measures towards our ships, this was well worth having. The Court of Peking probably hopes from us something better for itself than perfect neutrality as regards the rebels, and may have been confirmed in this hope by what our squadron, in mere self-defence, was compelled to do against them up the river. Should this tend to secure good faith and practical sincerity in the observance of the new treaty, we may accept the results with satisfaction, without troubling ourselves about the disinterestedness or purity of the motives. If they are encouraged to strenuous exertions, and put an end to this chronic civil war, which has desolated the country and paralysed trade, this will be a great common benefit.

It is only prudent, however, to note the extreme difficulty of predicating anything of a people whose ways are so diametrically opposite, in almost everything, to our own; who designate the compass as a "south-pointing needle," and who call the north-west the *west-north*, and the south-east the *east-south;* who mount a horse on the off side, and mourn for their relations in a complete suit of white; with whom the left hand is the place of honour, and who keep the head covered out of civility; who begin a book exactly where we end one, and read vertically from top to bottom, instead of horizontally from left to right; whose men wear petticoats and necklaces of beads, and carry fans, and whose women smoke pipes of tobacco, but do *not* wear crinolines; whose old men fly paper kites, while their little boys study philosophy; and who, *pour renfort de potage*, place the seat of the human intellect in the stomach!

The PRESIDENT.—You will return your thanks to Sir John Davis for his lucid description both of the geographical features of this river and of the character of the Chinese.

Then, pointing to a long Chinese proclamation which was suspended in the meeting-room, Sir Roderick said:—

There is here a proclamation or something of that kind in Chinese, taken by two English sailors, the sons of Mr. John Cleghorn, of Wick, who took it in warfare in the neighbourhood of Canton.

SIR JOHN DAVIS, F.R.G.S.—The red letters are used indiscriminately, except in the autograph of the Emperor himself to public documents. There is no particular distinction attached to red letters among the Chinese on other occasions. That appears to me to be a notice from the general of some body of men, I think not Imperialists, but probably the braves at Canton.

The PRESIDENT.—I entirely coincide with Sir John Davis in his eulogium upon Lord Elgin's expedition. There is no Englishman who does not feel that the efforts of Lord Elgin to open out China to British commerce are deserving of all praise. Now, at present, however, I must call upon gentlemen to speak to the geographical points of the paper, particularly to those extraordinary physical changes that have taken place in the bed of this great river, the longest in the Old World, and the only one that I have ever heard of up which a squadron of armed vessels, one drawing sixteen feet of water, has proceeded 600 miles into the interior of the country. When we know that this was accomplished through the energy of Lord Elgin and the naval officers who accompanied him, our attention is necessarily drawn again to the great difficulties which are presented every year to the navigator in ascending this river. Captain Collinson, who surveyed it a few years ago, will, I hope, explain to us the remarkable changes that have occurred since his time. In fact, from a letter which I hold in my hand from Mr. Blackney, of the *Acteon*, it appears that to navigate this river safely it will be necessary to have a fresh survey every year and a pilot for every fifty or sixty miles, so rapid are the changes. They depend, doubtless, upon this great feature of the interior of China, that as this large river, which is 3300 miles long, descends, it is fed by vast affluents that flow from snowy mountains. The sudden melting of the snow brings with it a quantity of boulder, sand, and mud, which encumber the bed of the river. On the other hand, the force of the current, so suddenly swollen, excavates deep passages for vessels in places which were formerly sandbanks. Besides Captain Collinson, we have also here Mr. Lockhart, who has already explained to us the great advantages of opening up the Yang-tse-Keang, and who has been so long resident in Shanghae. There is also present an American gentleman, Mr. Carr, who has ascended this river for some distance in a frigate of the United States. I call, therefore, upon these gentlemen and others who are interested in this most important subject to favour the Society with observations.

CAPTAIN R. COLLINSON, F.R.G.S.—Having taken a part in the opening of this great river, I look upon this exploration with great interest; and, with your permission, I will point out the progress of its examination. During the first year of the opium war, 1840, the entrance, as far as the north end of the island of Tsungming, was surveyed by Captain Bethune. Lord Amherst in returning from Peking in 1816, as Sir J. Davis has just acquainted us, came upon the river at Chenkeangfoo, and proceeded up it to the Poyang lake in Chinese boats. The fleet, under the command of Sir W. Parker, consisting of 75 sail, some of which drew more than 22 feet water, ascended the river to Nankin. The present expedition has proved that it is navigable for seaborne vessels beyond that city to Han Kow, and the portion between the Poyang lake and the latter city must be considered as entirely new, not having been explored before by Europeans. This opening of 600 miles of river navigation reflects the highest credit upon all who have been engaged in it, and it is a great pleasure to many of us here to reflect that there are several officers with whom we have been associated in other enterprises who have taken so prominent a part in this great expedition of Lord Elgin's into the interior of China.

With respect to the geographical point of the paper which relates to the change in the channel of the river between Nankin and the sea, I would observe, that it is a very difficult thing to fix the exact position of a ship where there are few or no landmarks, which is the case in the lower part of this river. It was, however, triangulated down by Captain Kellett and myself, and we are responsible for the soundings laid down on the chart of '42, all of which are correctly fixed. That changes will continually take place in the channels between Kushan and the sea must be expected, as up to this point the tide is felt; but I think above the Kushan crossing the navigation of the river will be more simple, though still liable to changes during the period of inundation.

The uncertainty of the navigation of the lower part of the river cannot be better proved than by the fact that we took the fleet up by one channel and were obliged to bring them down by another.

The chart of '42 will, however, be useful, to show the changes that have taken place, and afford a good foundation for reasoning upon the system of rivers, which can never be better exemplified than by the Yang-tse-keang; and I hope future navigators will continue to make observations upon the changes which take place, as they will prove highly interesting to geographers.

MR. LEWIS CARR, of the United States, and recently Assistant-Secretary of the American Legation in China.—I feel very highly complimented, Sir, at being called upon to participate in this discussion, but can scarcely hope to impart anything either of interest or novelty to the paper by Mr. Oliphant which has been read this evening. Nor am I unaware that there are present here this evening many distinguished officers of H. M.'s service and others, whose opportunities of observation in those waters have been much greater than my own, and who are prepared to address the Society. I am also without any notes of our trip up the river, having only been apprised this day of the subject that was to occupy your attention, and am therefore quite unprepared to speak otherwise than in a very desultory manner. It would be difficult to eulogise too highly the recent very successful expedition up this splendid river, an enterprise that reflects so much credit upon Lord Elgin, as also upon the officers of H. M.'s Navy.

It was my good fortune in the year 1854 to ascend the Yang-tse in a very large American man-of-war, under the command of Captain Franklin Buchannan, of the U. S. Navy. We are sometimes called a boastful people, and, perhaps, it is something to boast of, that the largest ship that ever ascended the Yang-tse-keang as far as Hu-hu was the U.S. steam-frigate *Susquehanna*, of 3000 tons, and drawing, I believe, 23 feet water. She was also the *first* vessel that ever disturbed the waters of this noble stream above Nanking.

I was attached to the American embassy in China in the year 1854, with His Excellency Robert M. M'Lane, and the *Susquehanna* having been placed at his disposal by our Government, he availed himself of the opportunity to ascend the river, more especially to ascertain something of the rebels who then held possession of it at Nanking and above. It was not the good fortune of Mr. M'Lane to have placed at his disposal such a squadron as accompanied Lord Elgin, nor to have had from his Government such entire *carte-blanche*, or perhaps the recent explorations of this river might have been anticipated. It was, in fact, with much apprehension that Captain Buchannan made the attempt at all; he feared the shallowness of the stream would embarrass him, as well he might, with a ship of that size, and all her armament on board. But after some little time he procured such information as could be obtained at Shanghae, and we left that place on May 22, 1854. Our experience in ascending the river may be made useful, inasmuch as the water was then almost at its highest. In entering the mouth, I have particular occasion to remember and to verify the truth of the remarks made by Captain Collinson, that it is almost impossible to get any bearings whatever; therefore, a nautical man must depend a great deal upon his good judgment. We were accompanied by a small steam-tender, which was of course of very great aid. After passing the mouth of the stream, the first difficulty we encountered was at a place called *Blonde* Shoal, which, if there are any officers in the expedition of 1842 present, they will remember. That was the most serious difficulty that we encountered. I believe it was so called from the name of an English vessel of war that ascended the river. This shoal, I think, is about 10 or 15 miles from the mouth. As we passed there very careful soundings were made, and the *Susquehanna* just touched as she passed over the shoal. The result was deemed very gratifying, for that was supposed to be one of the most serious difficulties. We encountered very little trouble after that until we came to the Langshang crossing, at a very large bend in the river. Upon approaching "Silver Island" we met the Imperial fleet. The ship was saluted by the entire squadron, which was promptly returned by the *Susque-*

hanna; and the Admiral in command came on board, and in a long consultation earnestly impressed upon Mr. M'Lane the propriety of the *Susquehanna* taking part in the contest that was then raging. The rebels had possession of the forts at Chin-kiang-fu, and the Admiral was very anxious that we should bring the ship up and aid the Imperialists in silencing those batteries. This was, of course, declined; he was assured that the Government of the States would be entirely neutral in the civil strife now extending itself over the empire. We encountered no other difficulty so far as the navigation of the river itself was concerned, and from that moment we went on with as much ease and safety as a ship of that size could go into any river in the world. The waters were very high, and, as has been observed by Sir John Davis this evening, it enabled us to see the surrounding country for miles. It seemed to be teeming with luxuriance—that is, before we reached the directions of the rebels. Upon approaching the forts of Chin-kiang-fu, a shot was fired at the vessel. She was stopped immediately abreast of the batteries, and orders were given to clear the ship for action; and a deputation was sent to inquire into the circumstances. The officers in command assured us that it was an accident, but at the same time they stated that it was very unwise to attempt going up the river, as their party had possession of it. They rather expostulated with us, but we intimated that the ship would go on. Notice was accordingly sent on to Nanking. No other hostile proceedings towards us were shown at Nanking: we anchored off the city, and remained there a few days. I remember going on shore, and making a visit to the far famed city. All was ruin and dilapidation, and it bore no resemblance to what one could have supposed Nanking to be. The appearance of the place was melancholy indeed; such desolation and misery everywhere observable, sufficiently told the tale of the recent disturbances. A more perfect burlesque on a military organisation can scarcely be imagined than the troops within the works presented; a motley crowd of men and half-grown boys had entire possession of all the water batteries that command the river at this point. I saw nothing that a company of marines could not have disposed of in half an hour.

After a few days at Nanking we proceeded as far as Wu-hu, one of the largest market-towns on the river, about 100 miles above Nanking. The city was visited by many of the officers; it is enclosed by a wall, and is said to have had, before the rebellion, a half million of inhabitants. Its trade at that time was entirely interrupted by the revolution, and the same scene of desolation was observed as at Chin-kiang and Nanking. This city is particularly alluded to by Sir John Davis in his work. We felt anxious to go thus far, inasmuch as it was described to be a place of some commercial importance. At this point the river was some 4 or 5 miles wide, and the stream deep, and there seemed to be no obstacle to going on as far as we thought proper. But upon a consultation it was deemed wise to return, and we did so. In descending the river, as we had no obstacles to apprehend, the ship made 14 knots an hour a good part of the way down, which shows how bold the river was and how readily it may be navigated. Whilst at Wu-hu we discovered coal in considerable abundance, obtained from a mountain 20 miles distant. It was a kind of semi-bituminous coal. From its appearance it occurred to me that it might be made very serviceable in the navigation of the river. We descended and reached Shanghae in safety, having been absent a fortnight. I would venture to make an additional remark touching the very great importance we should attach to these recent explorations in opening up the commercial advantages of the river. I am fully impressed with the belief that the river can be navigated as easily and as readily by steamers such as we use on the Mississippi, as the Mississippi itself. All it needs is steamers of that build, drawing 3 or 4 feet of water, and propelled by side-wheels. The state of the water even at the period that Lord Elgin ascended would be quite enough for steamers of that character.

MR. LOCKHART, F.R.G.S.—I believe that the hinderance to the navigation of the Yang-tse-Keang during Lord Elgin's expedition was caused solely by want of water. I think Captain Collinson's observation is quite correct with regard to the state of the river when he was on it in 1842, as it was then the month of July, when the river was full of water, in consequence of the heavy rain that falls on the immense extent of country drained by the principal branches of the Yang-tse-Keang, which causes the river to rise many feet in the summer months. At Shanghae we know very well that in the summer months an immense flood of water comes down the river, so that very frequently vessels anchoring out of sight of land can draw their water from alongside. The extent of fresh water is so great that captains of vessels know when they are approaching the coast, as they get into fresh water long before they see the land. In the winter, on the contrary, the salt water comes directly up to the mouth of the Shanghae river. From these circumstances it is clearly seen that the difference in the state of the river between the summer and the winter months is very great. The banks, which were exposed when Lord Elgin went up, are completely submerged in summer. From what has been observed of the sand-banks at the mouth of the Yang-tse-Keang we know that these banks are continually shifting, owing to the great body of water which comes down the channel, and pilots are consequently obliged to pay very great attention to the changes in these banks.

Although Captain Collinson's remark was perfectly correct regarding the state of the river at the time he visited it, I think if he were to survey it over again that he would find many of the sand-banks have considerably changed since 1842. The various landmarks on the banks of the river would of course be found to be correctly laid down, but the sand-banks in the stream itself would be found very much altered since the time when his survey was made.

I am not willing to detain the meeting at this late hour, but I wish to make one or two remarks regarding the Yang-tse-Keang. When I had the privilege of reading a paper on this river a year ago I stated,* on native authority, various circumstances regarding the city of Han-Kow, and the probability there was that the whole course of the river to that place would be found navigable by sea-going steamers. I am happy to find that those remarks have been confirmed by the experience of the expedition of Lord Elgin. The *Furious*, a large vessel drawing sixteen feet of water, reached this great town. Not only is this river valuable because of its being the great road between Shanghae, our most important port in all China, and Han-Kow, which is now our most westerly consular port, and which will be a place of great trade in future years, but because of the advantages which seem likely to arise from the access which we shall get through the upper branches of the Yang-tse-Keang to the interior of the country. The river has been surveyed up to Han-Kow, which is, indeed, only a small portion of its course. There are 2500 miles yet to be surveyed, extending up to Tibet; and I hope it will not be long before British travellers endeavour to trace up this mighty river to its sources. Beyond one point on the borders of the province of Sze-chuen we know there is no possibility of European vessels of any kind passing. There are great rapids in the river for many miles, which compel the Chinese to use portages at those places. Above Han-Kow the river divides into two branches—one, the Han-Keang or Han river, goes north, and penetrates into the provinces of Shensi and Honan, the gold regions of China; while the other, the main stream of the Yang-tse-Keang, traverses the western provinces and Tibet, and passes into the border land between China and India, across which the caravans for ages have passed between those two countries. In former times and in the days of the commercial prosperity of Venice, and before ships went to India by the Cape of Good Hope, all Chinese goods that were imported into Europe were carried by caravans through the passes of the Himalaya mountains across the frontier into India, and these caravans follow the same route at the present day for the supply of Nepaul. I have seen drawings of these caravans and the passes through the mountains in the Chinese magistrates' office at Shanghae. Our travellers from India endeavour to pass into Tibet by the route across the Himalayas; but I think the Yang-tse-Keang is the route by which they may hope to reach that country. I would call the attention of geographers to this, because here is a navigable stream by which they can travel through the whole of its course of 3000 miles into the border-land between China and India, and thence would be able to proceed to Calcutta. I look forward to the time when we shall have the course of the river open to us all the way up to the mountains of Tibet. Long have we endeavoured to find such a route, and now I think one has been opened by which we can pass from China into India with less difficulty than has hitherto been experienced in the repeated endeavours made by various travellers to enter China from our Indian territories.

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* Journal of R. G. S., vol. xxviii.

Tenth Meeting, April 11th, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*The Rev. G. C. Rowden; Colonel W. Pottinger; Captain R. H. Price; Colonel A. Lane Fox; and C. A. Duchet,* R.N., *and A. H. Macdougall, Esqrs.; were presented upon their election.*

ELECTIONS.—*The Hon. George Barrington; Captain Thomas Birch,* R.N.; *Rev. James Booth,* LL.D.; *Viscount Emlyn; the Hon. and Rev. F. S. Grimston; Consul W. T. Pritchard; and Edward C. Buckland; H. D. P. Cunningham,* R.N.; *Thomas W. L. Mackean; W. Walter Mantell; and William Wheelwright, Esqrs.; were elected Fellows.*

EXHIBITIONS.—A very rare French Atlas of Egypt, published by the Dépôt de la Guerre in 1807, presented by Mr. Robert Stephenson, M.P., F.R.G.S.; and a diagram of Captain Selwyn's apparatus for paying out electric telegraph cables, were exhibited.

In opening the business of the evening the President announced that Lord Stanley, Her Majesty's Secretary of State for India, had communicated to the Society copies of despatches, which completely set at rest the anxiety so long entertained respecting the fate of Adolphe Schlagintweit, who had proceeded into Turkistan from the Upper Punjab by a route considerably to the west of that followed by his brothers Hermann and Robert, and had advanced far to the north-west of their ultimate station, Elchi, before he met with his fate. By the return of one of his attendants (Abdullah) to Peshawr, *viâ* Bokhara and Cabul, as well as by a letter of another of them, Mahomed Amir, addressed to Colonel Edwardes, it appears that Adolphe Schlagintweit was well received at Yarkand, though he encountered great difficulties in reaching that city. On moving to the north-west, or towards Kokan, he fell in with a horde of fanatic Mussulmans, at Kashgar (which lies in about 41° N. lat. and 72½° E. long.), and in front of the walls of which place he was beheaded by orders of a ferocious Synd named Wulli Khan. After giving a sketch of the details, the President observed that, as great interest has been taken by all the British authorities in Upper India in the fate of this enterprising explorer—probably the only scientific European who has ever visited this wild and remote region since the days of Marco Polo—so it is hoped that some of his note-books and observations may eventually be recovered from the natives.

The Papers read were:—

1. CAPTAIN H. STRACHEY (Gold Medallist) *on the Death of M. Adolphe Schlagintweit.*

Communicated by the Right Hon. Lord STANLEY, M.P., F.R.G.S., Secretary for India.

Extract of a Military Letter from India, dated 26th January, 1859.

IN continuation of our separate letter, dated 22nd Dec., 1858, we have the honour to submit a farther communication received from the Foreign Department regarding the fate of the late Adolphe Schlagintweit, who, it now appears, was barbarously murdered at Kashgar by a fanatic Synd, named Wulli Khan.

From Lieutenant-Colonel H. B. EDWARDES, C.B., *Commissioner and Superintendent at Peshawr Division, to* R. TEMPLE, *Esq., Secretary to the Chief Commissioner of the Punjab Political Department.*

SIR,—I am not aware whether the Chief Commissioner has yet received a reliable account of the circumstances attending the death of M. Adolphe Schlagintweit; but at any rate it will be satisfactory to Government and to his friends to be able to compare the enclosed narratives of the sad event. No. 1 is the verbal statement of a Cashmir follower of M. Schlagintweit, named Abdullah, who arrived here *viâ* Bokhara and Cabul three days ago. No. 2 is the written report of a native of Ladak, named Mahomed Amir, who appears to have been provided by Lord William Hay as a kind of courier to M. Schlagintweit. He writes from Kokan, and Abdullah is the bearer of his letter. From these statements, which appeared to me substantially trustful, it seems that M. Schlagintweit was impelled by a desire to find a road to Yarkand which need not pass through Ladak; that he reached Yarkand—found that country harried by Crescentaders (*sic*) from Kokan, and passed on to Kashgar, where the same fanatical raids were going on; and the leader of one of them, a Synd, named Wulli Khan, seized M. Schlagintweit, and barbarously caused him to be beheaded, without any other offence apparently than that of being a foreigner. If anything could soothe the distress of M. Schlagintweit's friends in Europe, it would surely be the noble contrast between the enlightened purpose and humane search for knowledge which bore him into those wilds with his life in his open hand, and the barbarian's frenzy for the propagation of error by the blood of his fellow men. I have sent by separate parcel a slip of paper and a broken pocket-telescope, which were the only relics Abdullah could bring away with him.

I have, &c.,

Peshawr, Dec. 1858. HERBERT B. EDWARDES.

The statement of Abdullah Mahomed, an attendant of M. Adolphe Schlagintweit, is to the following effect:—

. . . He then, with the informant and four others, resumed his journey, and, at a distance of three days' journey from Yarkand, turned towards Sokut, and thence to Shumla Khoja. From this place he sent a servant to Yarkand to obtain information of the wars that were then going on, and learnt on his return that it was the Khan of Kokan who had been the aggressor, consequently he set out for Yarkand without hesitation. Passing Kirgan and Kuigluk, he arrived at the camp of one Tilla Khan, Synd of Kokan, who had come with an armed multitude to make a religious war with Yarkand. A sortie was made from the city against Tilla Khan, and obliged him to fly. M. Schlagintweit left his baggage, and fled with his followers to Kashgar. Here he found that another Synd of Kokan, called Wulli Khan, was then the king. He had himself just come on a religious war, and had conquered the place. M. Schlagintweit desired an interview with him, but he was refused, and was carried as a prisoner to the Khan, who, without any questioning or any apparent reason, ordered him to be beheaded. The execution took place immediately, outside the city of Kashgar. The informant was sold as a slave, but after various difficulties contrived to reach India.

Mahomed Amir of Yarkand, one of the above-mentioned four attendants, describes how the messenger was sent to Yarkand, and how, contrary to his own advice, M. Schlagintweit determined on going there. He says that on their approach to Yarkand they were treated with courtesy, receiving and giving presents. Thence they went to Kashgar, which was occupied by a Khojah of Kokan, who had installed himself in the city with his Mussulman troops; but the army of Khutta was in the field, besieging him, and every day there was a fight. The Khojah's people "asked who we were? M. Schlagintweit replied, that he was the Hon. East India Company's envoy, and was going to the Khan of Kokan; upon this they got into a rage, and ordered M. Schlagintweit to be beheaded, and I, with my followers, to be thrown into prison, and plundered of all our property." After thirty-five days the army of Khutta overpowered the Khojah and forced him to fly, and the informant was released.

The Second Paper read was:—

2. *On a New Projection of the Sphere.*

By Sir J. F. W. HERSCHEL, Bart., D.C.L., F.R.S., &c.

MY DEAR SIR RODERICK,—As President of the Royal Geographical Society, the Paper which I herewith send, may interest you. It contains an account of a projection of the sphere, so far as I am aware new, which offers several peculiar advantages for geographical purposes when the whole, or at least the whole accessible part of the globe has to be mapped down on one sheet. For, 1st, it gets rid of the extravagant distension in high latitudes, at least on one side of the equator, which the Mercator projection necessitates. 2nd. Like that and the stereographic projection, it exhibits all small portions of the sphere in their true forms without *distortion* of figure. 3rd. It exhibits large portions (as whole continents) with very much less variation of scale where great amplitudes are concerned than the stereographic, and for the whole of one hemisphere than the Mercator; while for the other, as far as the 50th deg. of latitude, it is no way offensive. 4th. It takes in at one view the whole accessible surface; and, what no other circular projection can do, it allows on one and the same plate a repetition of the map, or of any portion of it continuously right and left; so that, take what meridian you will for a prime meridian, it will, by merely placing that meridian upright before the spectator, give an equally convenient and natural *coup-d'œil* of at least 90°, or if it be preferred

180° on either side of it, and thus affords, what no other projection does, an equally clear and perspicuous representation, not only of the Indian, Atlantic, and Pacific Oceans, and the whole of the old and new Continents and Australia, but also of the North Polar basin —somewhat unduly enlarged, it is true, but exhibiting the whole coast-line infinitely less disfigured than in the Mercator charts.

The projection in question having been the direct result of a general mathematical inquiry into the subject, suggested by the consideration of Colonel James's recent projection, which takes in more than a hemisphere, I subjoin the steps of the investigation which led to it. Colonel James's projection takes in at the very extreme theoretical limit only about 132° of amplitude from the centre to the circumference of the map, or five-sixths of the face of the sphere; and even when restricted to 110° of amplitude, or two-thirds of the sphere, though very elegant and pleasing in effect as a picture, yet gives a very considerable amount of distortion of shape at the borders. The sketch marked (A) includes an amplitude of 160° of North Polar distance, or 97-100ths of the whole surface of the globe, and exhibits no *distortion*, and on the whole no more variation in the *scale* in the representation of areas for areas, than can very well be tolerated.

Should you consider this a fitting communication for the Geographical Society, I will beg the favour of your laying it before them; and meanwhile permit me to remain, my dear Sir Roderick,

Very faithfully yours,

J. F. W. Herschel.

In this paper the author investigates the general mathematical expression for the co-ordinates of any point in the projection in terms of the co-ordinates of the corresponding point on the sphere. The condition, that any infinitesimal rectangle on the sphere and its projection must be similar, leads to a differential partial equation of the second order, the solution of which gives rise to two arbitrary functions, entering into the expressions for the co-ordinates of the projected point.

These functions "being subject to no restriction, it is evident that we may superadd to the general conditions of the problem any which will suffice either to determine altogether or to limit the generality of the arbitrary functions in the view of obtaining convenient forms of projected representation. Suppose, for instance, we assume, as a condition, that the projected representations of all circles about a fixed pole on the sphere shall be concentric circles about a fixed centre on the plane." The author then shows, that on such a supposition, "if p be the polar distance of any parallel of latitude, and θ the radius of the circular segment representing that parallel, we have (taking 1 for the equatorial radius in the projection) $\theta = \left(\tan\frac{p}{2}\right)^n$, from which it is easy to calculate θ for each polar distance from 0° to 180°. This expression, it will be observed, still contains one arbitrary quantity, n. By giving specific values to n, we have various projections including and analogous to the stereographic. The author then calculates a table of values for the radii in the projection for the polar distances 0°, 10°, 20°, &c.—160°; for the values of n, 1, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{3}$.

"The *first* series of numbers," he concludes, "exhibits the progression of the radii of the successive projected parallels in the stereographic projection. The *second*, in that which occupies a section of 240°, such as by cutting out the unoccupied portion, would roll into a cone, well adapted for a transparent map on a lamp-shade. The *third* is that which occupies a semicircle—a convenient form for a reference-chart, but which becomes too much dilated beyond the 55th parallel of south latitude; and the *last*, that comprised in a sector of 120°, which is preferable to either, and seems to me not unlikely to supersede all other projections for a general chart."

Numerical Values of θ in the above Equation, when $n = \frac{1}{3}$.

$p =$	0°	10°	20°	30°	40°	50°	60°	70°	80°
$\theta =$	0·00	0·444	0·561	0·645	0·714	0·776	0·833	0·888	0·943

$p =$	90°	100°	110°	120°	130°	140°	150°	160°
$\theta =$ *	1·000	1·060	1·126	1·201	1·290	1·401	1·551	1·783

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* The general question has been also discussed by Gauss in an answer to the prize question proposed by the Royal Society of Copenhagen in 1822. His method is, in some respects, still more general than that of the present paper; but, although he arrives at, amongst others, an equivalent to the formula given above, or, rather, to that from which it was obtained, viz., $r = 2.\sqrt{z}.\left(\tan\frac{90-y}{2}\right)^n$, he does not particularly specify the "lamp-shade" projection, nor those represented by the third and the fourth cases.

In two memoirs, published in the Comm. Gott., vols. ii. and iii., the same author examines in considerable detail the projection of a spheroid on a sphere.—*Note communicated by F. G.*

The PRESIDENT.—The Society must appreciate highly any communication upon physical geography from so eminent an authority as Sir John Herschel. On this occasion he shows that this projection presents a more accurate representation of the world in one sphere than any other stereographic projection. It is not only more accurate than that of Mercator, but is, he suggests, more correct than the ingenious projection prepared by our associate Col. James, with which you may now compare it.

(The diagrams prepared by Sir John Herschel and those of Col. James were then exhibited to the Meeting.)

Robt. J.

The Third Paper read was:—

3. *Remarks on the Isthmus of Suez, with Special Reference to the proposed Canal.* By COMMANDER BEDFORD PIM, R.N., F.R.G.S.

DURING a visit to Egypt in December last, my attention was forcibly drawn to a subject that has for the past few years engaged a considerable amount of public interest—the cutting a canal across the Isthmus of Suez.

While in Cairo I had the advantage of making the acquaintance of gentlemen well qualified, both from local and professional knowledge, to form a dispassionate opinion on this much-vexed question, and I now propose to review the subject in its various bearings, so as to enable the Society to form an independent judgment of its merits.

I shall begin with describing the geographical position and physical features of the country, then detail the attempts of the Ancients at canalization, and conclude with a narration of the various plans and projects which have been proposed in modern times.

Egypt, of which the Isthmus of Suez is a component part, lies between the 29th and 33rd degrees of E. long., and in both these meridians is bounded by sandy deserts. On the north is the Mediterranean, in the 31st parallel of north latitude, while to the south of parallel 23° is the boundary line. On the south-east the waters of the Red Sea wash the coast and form the roadstead of Suez, whence to Pelusium, namely the "Isthmus," the distance is only 65 geographical or 74 statute miles; Suez being situated in 29° 58′ 37″ N. lat., Tineh, the ancient Pelusium, in 31° 3′ 37″ N. lat.

The northern or Mediterranean coast presents a barren appearance, and consists of low sandy hillocks and swamps. Excepting Alexandria, no sort of harbour for vessels of any size exists. The water in the vicinity of the land is shallow, the bottom shelving very gradually towards the beach, especially so in the Bay of Tineh or Pelusium, where the depth of 25 feet averages a distance from the shore of more than 3 miles. The current has a constant easterly set, the velocity of which is much influenced by the strength of the wind. The tides have a very inconsiderable rise and fall, and are more or less dependent on the winds; the maximum height ever recorded being only 2 feet 8 inches.

The prevailing winds are westerly and north-westerly in July, August, and September, and continue to blow very much in the same direction, with the exception of an occasional gale from the south-west, until March; the southerly winds then prevail until June, during which month easterly winds with thick weather and northers at night may be expected. Thus, during the greater part of the year westerly and north-westerly winds cause a constant swell and surf to roll into the exposed Bay of Pelusium, which is open to sixteen points of the compass; and, when to this is added the extreme lowness of the coast, without a single feature by which any part can be recognized, some idea may be formed of the difficulty and danger of the navigation.

The south-east or Red Sea coast-line is also extremely arid and sandy, but unlike the-Mediterranean shores, which are flat, parts of it, such as Gebel Awebel and Gebel Attaka, may be called mountainous. In the immediate vicinity of Suez the land is low, and the roadstead encumbered with shoals and sandbanks, the latter of considerable extent, jutting far into the sea, and susceptible of movement in heavy winds.

The harbour of Suez is only accessible to the small native coasters, and even the roadstead has only a depth of 25 feet at about 3 miles from the quay. The currents in the Red Sea are influenced by the winds, and according to their strength attain a velocity of from 15 to 20 miles in the 24 hours. The tides have a much greater rise and fall than in the Mediterranean, the maximum height being 7 feet 2 inches, and the minimum observed 2 feet, showing a difference of 4 feet 6 inches between the highest tide of the Mediterranean and that of the Red Sea. The prevailing winds from March to November are northerly, but during the remaining three months, December, January, and February, southerly winds blow, though by no means steadily. This law is subject to some variation down to the Red Sea, but as a general rule it holds good as far as the straits of Babel Mandeb. The Red Sea runs about north-west and south-east 1308 miles from Suez to Aden, with a varying breadth of from 30 to 200 miles. The navigation is rendered very unsafe by the numerous rocks, shoals, and coral banks which fringe the shore on either side, but the centre is deep and free from any dangers; this has been abundantly proved by the steamers of the Peninsular and Oriental

Company, which have navigated that part of the sea for many years without accident. On the other hand, sailing ships beating against the northerly wind are obliged to approach the shore on either side, and often become hopelessly involved in the perils just alluded to: in fact, the average loss of shipping during the last year was 1 in 10—not clumsy colliers, but fine ships, English and American, some of them upwards of 1000 tons.

Of 12 vessels which have lately reached the port of Suez from Aden, the average passage has been 52 days, which is rapid to what it used to be, and is the result of employing first-class ships. The passages from England to Alexandria and from Aden to Suez are the most tedious in the world; the first averages 55 miles per day, the latter 25 miles, while other ocean routes average 100; therefore, in making a comparison, the distance between England and Egypt must be multiplied by 2 at least, and between Suez and Aden by 4. Thus it is certain that neither in the Red Sea nor the Mediterranean navigation can safety or certainty of passage be looked for by sailing ships, and the captain of a merchant ship would think twice before he adopted such a route.

The physical features of Egypt are unique; it has been well named the "River Land." In its pristine state it was doubtless a complete desert, but the Nile, overtopping its banks, flooded the sandy surface, and, depositing its rich alluvium, soon reclaimed by its fertilizing effect a large portion of the adjacent wilderness.

The Nile has a total length of 1320 miles from source to mouth, but taking the windings into consideration it is nearly twice as long—viz. 2240 miles. The depth is most irregular: 50, 60, and even 70 feet often occur; but shoals, stretching from bank to bank, and having only 2 or 3 feet water on them, are frequently met with, so that the river is not navigable for vessels larger than our Thames boats. At nearly 100 miles from the sea the waters divide into the Damietta and Rosetta branches, and form the far-famed Delta, which is an immense triangular plain, well cultivated by means of a most elaborate and pains-taking system of irrigation. It has been calculated that the Nile valley, as far as the apex of the Delta, averages a breadth of about 7 miles; namely, in the widest part 10 or 11, and in the narrowest 2 miles across, being, as already observed, entirely due to the alluvium deposited at each high Nile to the depth of 0·004 inches, and which, according to Reynault, in his 'Mémoires sur l'Egypte,' contains 11 water, 9 carbon, 6 oxide of iron, 4 silica, 4 carbonate of magnesia, 18 carbonate of lime, 48 alumina = 100.

Besides the amount of alluvium deposited, millions of tons are annually discharged into the Mediterranean, and meet an east-going current which carries the mass towards the Bay of Pelusium. The effect of this mud-carrying current would be to silt up any harbour or channel which came in its way. A striking instance of the quantity of mud discharged by the Nile is related in Dr. Clarke's 'Travels.' He says:—

"*July* 16*th*.—This day, being Sunday, we accompanied Captain Culverhouse, H.M.S. *Romulus*, to the gun-room, to dine with his officers, according to his weekly custom; as we were sitting down to dinner the voice of a sailor employed in heaving the lead was suddenly heard calling 'half four.' The captain starting up reached the deck in an instant, and almost as quickly putting the ship in stays she went about. Every seaman on board thought she would be stranded. As she came about, the surface of the water exhibited a thick black mud. This extended so widely that the appearance resembled an island, at the same time no land was really visible, not even from the mast-head, nor was there any notice of such a shallow in any chart on board. The fact is (as we learnt afterwards) that a stream of mud, extending for many leagues off the mouths of the Nile, exists in a moveable deposit on the coast of Egypt."

During the periodical overflow of the Nile, its waters attain in Upper Egypt the height of from 30 to 35 feet; at Cairo about 23 feet; and in the northern part of the Delta only 4 feet. It begins to rise at Cairo about the beginning of July, increases during 100 days till the middle of October, then subsides, and arrives at its lowest point near the end of April. During the period of inundation the current is very powerful, so much so that fresh water may be skimmed off the surface two or three miles at sea. The average force of the current throughout the year may be considered 2¼ miles per hour. The minimum discharge has been estimated at 54,000,000 cubic feet of water per hour. The amount of alluvium deposit is 0·004 inches. At the mouth of both the Damietta and Rosetta branches there is a bar in the form of a horse-shoe, with an average depth of 5 feet water. During high Nile the great velocity of the stream drives this bar some distance to seaward, but, as the strength of the current diminishes, it returns to its original position in the old form.

The entire supply of sweet water for the whole of Egypt is derived from the Nile; there are wells, it is true, dug in the sands, but the water they contain is generally salt, and even under the most favourable circumstances brackish.

The stratification of Lower Egypt belongs entirely to the tertiary formation.

The eastern longitudinal Talus of the Libyan Desert, forming the western boundary line of the Nile Valley, is composed of parallel layers of more or less argillaceous and arenaceous limestone, alternating with beds of shale of variable thickness, the dryness of the soil imparting hardness to the layers of clay. On the eastern side of the valley, the part we have to do with, the surface consists of loose sand. Sand-hills of some height frequently occur, and the sand on these hills is so extremely fine that it is put in motion by a very slight wind, and wells,7 or 8 feet deep are filled up in one storm. The highest part of the isthmus is about 40 feet, and is near the Bitter Lake Basin, which is 37 feet below the level of the sea. There are several depressions covered with salt, into one of which (that is to say Lake Timsah) the Nile during inundations sometimes finds its way. The basin of Lake Timsah is 2 feet below the level of the Red Sea.

To the northward nothing but flat sand-plains present themselves as far as Lake Mensalah, which bears the character of a quicksand, and, consequently, is dangerous to travel near. Below the surface of the isthmus, at a mean depth of 13 feet, water is met with, and most probably the subsoil would partake very much of the "quick" character of Lake Mensalah.

Such a soil as that just described would be difficult enough to excavate, the sand having a tendency to fall in as fast as thrown out; and when the watery subsoil is reached, how much greater would be the difficulty!—in fact it is problematical if a cutting could be made at all. Then, as regards Lake Mensalah, no one can tell to what depth the walls must be sunk before the excavations could be commenced.

It would seem that when Egypt (780 B.C.) had attained a maritime supremacy, and its commerce began to extend to Arabia and India, the project naturally arose of opening out an easy mode of access to the Nile by means of a canal connecting that river with the Red Sea. According to Strabo, Pliny, and Aristotle, the attempt to cut a canal to the Red Sea was first made by Sesostris, about the time of the Trojan war, B.C. 1184. This canal, however, appears to have been intended for irrigating purposes only. Herodotus informs us that the work was commenced in the reign of Nico, B.C. 600, who failed to accomplish his object in consequence of being warned against it by an oracle. The next attempt was made during the Persian occupation by Darius, who is said to have cut from the Bitter Lakes to the sea, but no account can be found of the opening of this canal; indeed Aristotle asserts that the work was stopped in consequence of the different level of the Red Sea.

Ptolemy Philadelphus, B.C. 254, has the credit of completing this great undertaking; but I am of opinion, after a careful examination of the ground, that it was not by cutting a canal, but rather by the construction of a good road, the remains of which are very distinct, and over which, no doubt, the "ships of the Desert," as the camels are called in the Arabian language, passed to and fro. The ambiguity of this phrase has most probably led to the belief of a ship-canal through the Desert—a mistake easily made by writers who depended on the *vivâ voce* statements of the natives. The Caliph Omar removed the point of junction from Bubastis, higher up the Nile, by which means he obtained 6 feet more rise, and, consequently, the navigation of the canal was much prolonged; before that time it had only been navigable two months in the year.

Besides the usefulness of this canal as a means of transit, vast tracts of desert were reclaimed by its fertilising influence, and flourishing cities sprung up on its banks and decayed on its disappearance, the ruins of which are still to be seen. Its original course was as follows:—Commencing at Bubastis, on the Pelusiac or eastern arm of the Nile, now completely filled up, it was conducted to Lake Timsah on the Crocodile Lakes, and thence to the Bitter Lakes, where, as I said before, I suspect the canal ended. The cutting was altogether about 60 miles, averaging a breadth of 150 feet and a depth of 20 feet.

This circuitous communication was probably preferred both for local and political reasons, but, unfortunately, there is no information regarding the effect this great undertaking produced on the commercial prosperity of the country. Under the Romans it was little used, but the Saracens found it of importance in their communication with Mecca. It is probable that the great amount of time and labour required to keep the canal in working order, and the fact that, in practice, the primitive mode of transit by caravan was cheaper and better adapted to the requirements of the country, were the reasons it so repeatedly fell into disuse. With some little trouble the extent and direction of both road and canal can still be made out.

I have now given as brief an account as possible of the geographical and physical features of Lower Egypt, and the attempts made by the ancients to unite the Mediterranean and Red Sea. Certainly, both natural causes and the antecedents of the country seem to sound a note of warning against the idea of canalization. Indeed, the geographical position of the isthmus, its exposed and dangerous northern coast, as well as barren and impracticable soil, offer obstacles of so grave a nature to the successful accomplishment of such a project that, if ever carried out, the other marvels of Egypt would dwindle into insignificance before it.

Every one must be struck with the grandeur of the idea of dividing two continents so as to enable large ships to proceed direct from the ports of Europe to ports of the East. The realization of such an idea would certainly be quite in accordance with the spirit of an age in which so much has been done to annihilate time and space; and, doubtless, neither talent, energy, nor wealth would be wanting to make the attempt, could even a chance of success be shown.

At the close of the last century the great Napoleon attempted to conquer the "Land of Egypt," then, as now, the key to our Indian Empire; and he was convinced that the permanent possession of that land was the key to universal empire. The measures adopted by him to retain it in his grasp were worthy his genius. To him is due the conception of the canalization of the Isthmus of Suez, and he argued, if a direct means of communication with India could be effected, not even England, with all her wealth and manufacturing powers, could compete commercially with Marseilles, or any of the Italian, Greek, or Austrian ports of the Mediterranean, each of which would have the advantage of being nearly half the voyage in advance of this country, as the following table will show:—

Distances to Bombay.

	Viâ Suez. Miles.	Viâ Cape. Miles.
Constantinople	5,400	18,300
Trieste	7,020	17,880
Marseilles	7,122	16,950
Cadiz	6,672	15,600
London	9,300	17,850

No doubt the attempt to unite the two seas would have been made had Napoleon been left in quiet possession of the country, but the British, in those old-fashioned days, strongly objected to the occupation of a road to their possessions, and therefore summarily ejected the French from Egypt. The idea of joining the Mediterranean and Red Sea by means of a canal received, as already observed, its first impulse from the great Napoleon, and, since that period, various plans have been devised to carry out such an undertaking, all of them, however, based on the result of the levellings of the French Savans in 1799, who reported that the Mediterranean was 30 feet below the level of the Red Sea at Suez. It appears to have been a received opinion of the ancients that a difference of level must exist between any two neighbouring seas.

The Egyptians no doubt assumed a difference of level, which was the more extraordinary as they were such excellent hydraulic engineers: even the French fell into the same error; in short, such a notion prevailed until very lately:—for instance, the Mediterranean was conceived to be higher than the Atlantic; the Euxine as much as 40 feet above the Ægean; and, still more strange, the gulfs of Egina and Corinth were supposed to have a very great difference of level. Even as late as the commencement of this century few dared call this theory in question, but it is worth noting that Laplace and Fourier came to the conclusion that a difference of level was impossible.

In the present day it is received as an axiom that no matter how narrow the separation between the two seas, both of them belong essentially to that vast expanse of ocean, and are therefore subject to the same levelling law.

This fact was not proved till 1846: in that year M. Talabot, an eminent engineer, M. de Negrelli, an Austrian, and Mr. Robert Stephenson entered into a formal agreement to share the labour and cost of a preliminary investigation, with a view to test the practicability of a project suggested to M. Talabot by Linant Bey, a French engineer, resident many years in Egypt,—namely, cutting a canal across the Isthmus of Suez.

A corps of scientific engineers was accordingly sent out, and reported in January, 1847, that, after the most careful series of levels, they had ascertained beyond question that no difference of level whatever existed between the two seas, and that consequently a canal, capable of being scoured by the waters of either sea, was impracticable, especially as both may be said to be nearly tideless.

The arrangements made by the three gentlemen just named were as follows:—M. Talabot was to superintend the levelling operations, M. de Negrelli to undertake the hydrographical inspection of the Bay of Tineh or Pelusium, while Mr. Robert Stephenson examined the Red Sea outlet of the proposed canal in the vicinity of Suez.

Circumstances prevented Messrs. Talabot and Negrelli from visiting Egypt, although they were represented by carefully selected employées, but Mr. R. Stephenson made a personal inspection of the ground, and thoroughly mastered all the scientific and technical details of the project. The result of these admirable arrangements was a complete exhaustive survey of the locality, which led to the unanimous conviction that the construction of a direct canal between Suez and Tineh was a difficulty insurmountable.

A comprehensive report of these proceedings was drawn up by M. Talabot, and is one of the most lucid documents ever written on the subject. The evidence just detailed appeared so conclusive that all idea of joining the two seas by an open cut was abandoned. It may be interesting to state that the cost of the investigation amounted to no less a sum than 4500*l.*, which was paid by the gentlemen I have named, to whom doubtless the credit is due of setting at rest the much-vexed question of difference of level between the Mediterranean and Red Sea. Since 1847 the Isthmus has been twice re-levelled, each time with the same result as at first.

For several years the Suez Canal project remained closed and abandoned, but the idea of overcoming a barrier apparently so insignificant as the Isthmus was not permitted to rest. M. Talabot himself suggested a plan by which he hoped to lessen some of the difficulties. Messrs. Barrault likewise submitted proposals, and both these projects I shall briefly detail.

M. Talabot proposed to start from a point about 6 miles below Suez, where deep water is found near the shore; to follow the "Ouadee Toumilat," and proceed to within a short distance of Cairo, to cross the Nile above the Barrage without making use of the stream itself; thence to take the direction of Alexandria, where the canal would terminate in the old harbour. The length of the canal would be about 250 miles, breadth 328 feet, and depth 26 feet, and it would be fed from the Nile.

M. Talabot proposed to cross the Nile by an aqueduct, the surface of the water in which was to be raised 40 feet above the level of the high water of the Nile, and 60 feet above the low water level. It was to be 3500 feet in length, and reached by four locks at each end, by which the summit level could be attained by the largest ships.

This aqueduct would indeed be one of the wonders of the world. M. Talabot was quite alive to the difficulties of the scheme, but he offers the proposal as preferable to a direct canal from Suez to Pelusium.

The plan of Messrs. Barrault is to proceed from Suez to Lake Mensalah in a direct line, then to turn in a direction parallel to the sea for a distance of more than 100 miles, into the *new* harbour at Alexandria. Instead of crossing the Nile above the Barrage, it will be seen that they prefer carrying their canal across the mouths of the Damietta and Rosetta branches. Neither of these schemes offers a solution of the problem, for independently of the enormous expense and many engineering difficulties frankly admitted by the projectors, local and political causes present such serious impediments as to be of themselves decisive against either proposal.

In spite of the conclusions arrived at, after the most careful investigations of the eminent engineers mentioned above, that the direct canal from Suez to Tineh was impracticable, the project has been again revived.

M. Lesseps, a gentleman who formerly held a diplomatic appointment in Egypt, has taken up the question with an energy and zeal worthy of success.

In November, 1854, he presented to Said Pasha, the present Viceroy of Egypt, a memorial on the subject, which sets forth:—

"That the utility of a navigable canal joining the Mediterranean and Red Sea has always been recognised.

"That Napoleon when leaving Egypt said, 'It is an important affair; it is not now in my power to accomplish it, but the Turkish Government will perhaps one day owe its preservation and its glory to the execution of this project.'

"That the moment has now arrived to realise Napoleon's prediction.

"That M. Lepère (50 years ago), Linant Bey, Gallici Bey, and Mangel Bey, agree in the possibility of a direct cutting.

"That the cost of the canal of Suez is not out of proportion with the utility and profits of this important work, which would curtail by more than one half the distance of India from the principal countries of Europe and America.

"That the pilgrimage to Mecca will henceforth be assured and facilitated to all Mussulmans; an immense impulse given to steam navigation and to distant voyages; the countries on the coasts of the Red Sea and the Gulf of Persia, the eastern coast of Africa, India, the kingdom of Siam, Cochin China, Japan, the vast Empire of China with its more than 300,000,000 of inhabitants, the Philippine Islands, Australia and that immense archipelago towards which the emigration from old Europe is directed, brought nearer by nearly 3000 leagues to the Mediterranean Sea and the north of Europe,—such are the sudden and immediate effects of cutting through the Isthmus of Suez.

"That the yearly European and American traffic round Cape Horn and the Cape of Good Hope is 6,000,000 tons, and the world's commerce would realize 6,000,000*l.* annually by sending the ships *viâ* the Gulf of Arabia.

"That if only 3,000,000 tons passed through the canal, there would be an annual produce of 1,200,000*l.* by collecting 10 francs per ton.

"That the political advantages are equally incontestable. To England—mistress of Gibraltar, Malta, the Ionian Islands, Aden, important stations on the east coast of Africa, India, Singapore, and Australia; to France; to Germany,—for Prince Metternich and

Baron de Bruck have long seen that in the question lay the aggrandizement of Trieste and Venice; to Russia, United States, Spain, Holland, all the towns of Italy, and ports and islands of Greece."

In consequence of the above representations the present Viceroy of Egypt, Said Pasha, granted a firman of concession to M. Lesseps, subject of course to the approval of the Sultan. M. Lesseps' first step was to cause MM. Linant Bey and Maugel Bey to examine the ground, and submit to him a plan of operations and an estimate of expenses. Their report, which formed the groundwork of future proceedings, may be briefly summed up as follows:—

The canal starts from the eastern portion of the Gulf of Suez: it traverses, taking a direction almost due north, about 15¼ miles, which separate Suez from the basin of the Bitter Lakes. It traverses also these lakes unembanked, and from the northern extremity of the Bitter Lakes it proceeds, cutting through the plateau of Serapeum towards Lake Timsah. This lake it also traverses, and, winding round the plateau of El Guisr, it skirts the eastern border of Lake Mensalah, and falls into the inner part of the Bay of Pelusium, whence it is prolonged into the sea until it reaches a depth of 24 feet. The width proposed was 330 feet, and the minimum depth 21 feet below low water of the Mediterranean. The locks, two in number, were to be 330 feet long, 70 feet broad, with a minimum depth of 21 feet. The estimated cost for the entire undertaking amounts to 162,550,000 francs, or about 6,500,000*l.* sterling, and it was calculated that six years would be required for the completion of the work. It has been proposed to modify this plan by removing the point of junction with the Mediterranean 18 miles to the westward, and to do away with the locks altogether; the canal will therefore be 92 miles in length without a single lock. M. Lesseps now proceeded to make his scheme public, and followed up that act by appointing in the name of the Pasha an international commission, composed of 13 gentlemen well qualified to give an opinion on the subject. The different countries were represented as follows:—England, 4; France, 4; Holland, 1; Germany, 2; Spain, 1; Italy, 1. Their published report, which is an extremely able document, confirms that of MM. Linant Bey and Maugel Bey in every essential particular, but does not mention the mode of constructing the ship canal, or supplying it with water, and not a word is said of the difference of opinion which existed among the members. A difference of opinion, however, did exist, and one of no mean importance, inasmuch as one party pronounced in favour of M. Lesseps' scheme, while the other declared it impossible to dredge or cut a channel through Lake Mensalah at a depth of 24 feet below the Mediterranean, and thence across the Isthmus of Suez to the Red Sea. M. Lesseps, however, was naturally anxious to insure unanimity at Alexandria, and himself suggested that every word relating to the mode of construction and supplying with water should be omitted in the report and reserved for discussion in Europe. At the discussion the majority of the commission voted in favour of the open cut without locks; the minority proposed another plan, which might be considered feasible, while they regarded the open cut as impracticable: their project is to construct a ship canal in nearly a direct line between Suez and Port Said, the level of top water throughout the whole length (93 miles) to be 23 feet above the low water of the Mediterranean Sea; the embankment to be carried into the deep water of the sea at each extremity, so as to avoid the necessity of dredging, and the locks to be constructed similar to the sea lock of the Caledonian Canal. The canal to be supplied with water from the Nile, at a point below the Barrage suitable for that purpose.

This, then, is the present condition of the scheme; opinions are divided as to its practicability, and M. Lesseps now only waits the formal permission of the Sultan and the Pasha of Egypt to commence operations. I shall now endeavour, as briefly as possible, divesting the question of all technicalities, to show cause why the cutting a canal across the Isthmus of Suez is a hopeless undertaking.

Commencing with the Mediterranean outlet of the proposed canal, viz. Port Said, we find that a harbour has to be built which is in itself a colossal work; the piers composing which would aggregate at the very least seven miles in total length, of an uniform depth, certainly not under thirty feet, with parapets and lighthouses of considerable height.

The material for the rubble-work alone can only be obtained at a distance of a hundred miles, while the stone for the finishing-work is much farther off, in the islands of the Mediterranean; thus, then, the building operations would assume gigantic proportions. To bring a case in point familiar to all, this part of the undertaking would demand twice the labour and material required for the construction of the Breakwater at Plymouth. But when, in addition to this, it is known that the site of the proposed harbour is on an exposed and shallow coast, subject to violent gales, a lee-shore a great part of the year, and with the bottom of the sea uncertain as a foundation for the piers; and, lastly, when it is borne in mind that the well-known prevailing mud-carrying current must soon silt up the entrance and channel, and that dredging can only be resorted to under favourable circumstances, the most unthinking must see that the success of this undertaking is involved in the greatest uncertainty. Before leaving this part of the subject, I will briefly allude to the cost of such a work. Take the Breakwater at Plymouth for example, which cost 1,500,000*l.*, and was twenty-eight years in finishing: surely a work of twice its magnitude and labouring under much greater disadvantages would cost twice as much; but, instead of the estimate of Port Said being 3,000,000*l.*, it is only put down at 842,362*l.* in M. Lesseps' scheme. We now come to the canal itself, an open cut without locks, of 92 miles in length. To dredge such a cut 26 feet below low water of the Mediterranean has been pronounced impracticable by the very highest authority.

I shall not touch on the technical points of objection, but merely ask you to picture to yourselves the cutting a trench 92 miles in length, 330 feet broad, and 26 feet below the low-water level of the Mediterranean; for though it is true that certain depressions occur on the route, viz. Lakes Timsah and the Bitter Lakes, yet one is only two feet below the Mediterranean, and the other would require embankments; and when the cutting through the elevated ground is taken into calculation, it will be quite evident that the gain is balanced by the loss. The mere labour of such a work is enormous; but when the nature of the soil is considered, it indeed assumes a hopeless appearance; the sand to an average depth of 13 feet might be removed, but at that depth water is met with. Lake Mensalah has the character of being like a quicksand, and most probably the entire subsoil will prove more or less the same. Yet for this gigantic undertaking the estimate is only 3,500,000*l.* As a check to this estimate, I will remind you of the dimensions and cost of the Caledonian Canal, one of the largest ship canals in the world: its cuttings are about 25 miles, its depth 15 feet, width 50 feet, and cost about 1,000,000*l.* The Suez Canal in actual length only is nearly four times as long, but when the breadth and depth are considered it cannot be calculated at less than eight times the size. To be within the mark in making a comparison of cost, always supposing no greater difficulties than those met with in the construction of the Caledonian Canal, I consider 6,000,000*l.* the least sum that can be required.

We now arrive at the Red Sea outlet of the canal, viz. the Port of Suez, and here again difficulties are met with. Piers of scarcely less aggregate length are proposed, which traverse a sandshoal; lighthouses, &c., have to be constructed; but as the material is close at hand, these difficulties may be overcome; the estimate, however, of 345,982*l.* 9*s.* 7*d.* seems out of proportion to the nature of the works, and, judging by the cost of similar undertakings, 1,500,000*l.* would at least be required.

Thus it appears that, supposing only ordinary difficulties occur, the sum of 10,500,000*l.* would be requisite for the mere construction of Port Said, 92 miles of canal, and Port Suez. M. Lesseps himself fixed the contingent work and other expenditure at 3,500,000*l.*, therefore the grand total for works would amount to 14,000,000*l.*; when, however, the serious obstacles I have detailed, and which will inevitably be met with, are taken into consideration, it must be evident that the 14,000,000*l.* I have named may be increased *ad infinitum*; in fact, from the outset the utmost uncertainty regarding expenses must prevail. At first sight it seems difficult to understand how such a small estimate as 8,000,000*l.* could have been supposed sufficient. But it is probable that Messrs. Linant Bey and Maugel Bey have been dealing with forced labour, and the expenditure of money of which no account has been given. This forced labour is slavery in its worst form. The Fellahs are compelled to leave their homes at the will of the Pasha: the Mamaudieh is a melancholy instance of this; 20,000 of the workmen are said to have perished during its construction. Males of all ages, from children ten years old and upwards to old age, are taken from their native villages and made to work. I have myself often seen the poor wretches in gangs of hundreds, surrounded by overseers with sticks, whose duty it was to beat any symptoms of laziness out of them. The Fellahs naturally look upon the canal scheme as the certain grave of thousands; they know the locality is entirely destitute of water, and they have vividly in remembrance the late disasters in the vicinity of Suez, when so many of their numbers perished. The Fellahs, it is true, make excellent navvies—witness the railway they have constructed; but in that instance they entered into the spirit of the work and appreciated its importance, in proof of which they lately volunteered to make the embankment, if the rails were provided, from the main line to Samanhour, and also to Zagazig, both of which branch lines are now in course of construction, and when finished will open up the richest part of the Delta.

Having now disposed of the question of practicability, let us examine whether, under different circumstances, the Suez Canal would have been a paying concern. The facts I am about to quote are of the latest date, and have been in the kindest manner furnished by the Peninsular and Oriental Company and the Board of Trade. In the first place, the distance from England to the East Indies (say Calcutta, for instance) is 13,000 miles *viâ* the Cape of Good

Hope; while, by way of Gibraltar, through the proposed canal, and down the Red Sea, the distance is 8000, showing a difference of 5000 miles in favour of the canal route. This is apparently a great gain; but, upon reference to the difficult navigation of both the Mediterranean and Red Sea, it will be found that the average passage of twenty fine ships last year to Alexandria was 54 miles per day, and of twelve ships to Suez 25 miles per day. Now a small average, by way of the Cape of Good Hope, is 130 miles per day; therefore, basing the length of voyage on that calculation, the distance from England to Calcutta by way of Suez would be 16,000 miles, without taking into consideration the length of the canal or the delay in passing through it. This is conclusive as showing that the voyage round the Cape of Good Hope can be made in a shorter time than by the proposed canal, to say nothing of the dangers of the Red Sea, which occasion the loss of one ship in ten traversing its waters. We will now glance at the financial prospects. The arrivals in the United Kingdom of English and foreign vessels from ports of the East Indies, by way of the Cape of Good Hope, amounted last year to 718,992 tons. Supposing all these ships used the canal, the revenue, at 10 francs per ton, would not amount to 300,000*l.* per annum, not quite 4 per cent. on the low estimate of 8,000,000*l.*; but, as shown above, the canal route would never be chosen by sailing ships; and, as the transport of goods of little value compared with their bulk must, from the small stowage in steamers, be forwarded in sailing vessels, therefore a very large number will ever continue to make the voyage round the Cape of Good Hope, even if the canal were completed. As the proportion of sailing-vessels to steamers in England is 13 to 1, the largest steam mercantile marine in the world, it will be seen at a glance how few vessels there will be calculated to benefit by the proposed canal.

Reviewing all the circumstances I have detailed, it seems clear that the direct open cut from Pelusium to Suez is impracticable; that any canal would be useless except for steamers; that the proportion of that class of vessel is so small that the tolls collected upon the whole number would not maintain the proposed gigantic works; and, finally, that the opening of a direct cut across the Isthmus of Suez would be merely adding 100 miles to the delays and difficulties of Mediterranean and Red Sea navigation.

While I have not hesitated to denounce the union of the two seas by a direct cut across the Isthmus of Suez as hopeless and impracticable, I have not lost sight of the necessity of diminishing by every possible means the time occupied in the voyage between the mother country and her colonies. The importance of maintaining a rapid means of communication with India has been abundantly demonstrated by the late stirring events in that country, and, although it is true that the "Overland Route" is indeed a stride in the right direction, and calculated I believe to maintain a supremacy over any other route, yet it is still in its infancy. At Alexandria itself, for instance, difficulties and delays are met with in consequence of the harbour being open to the prevailing winds, which often blow with great violence.

The management of the railway from Alexandria to Cairo is most faulty, while the continuation of the line to Suez is positively dangerous, and the roadstead at that terminus inconvenient and tedious for the transhipment of goods and passengers; but, before entering more fully on that subject, I will briefly detail the rise and progress of the present mode of transit from Europe to the East Indies.

Very early in the present century attention was directed towards an overland route to India, but it was not until 1823 that any movement of consequence was made. Certain members of the Indian Government proposed to the home authorities to forward mails and passengers by way of the Red Sea, across the Isthmus of Suez, and thence through France or by sea to England; but this proposition did not meet with favour.

After allowing the above proposal to germinate for three years it was again brought forward, but still did not produce fruit. The Government advanced a host of objections against the plan, and it is doubtful how long this state of affairs might have lasted had not an individual cut the Gordian knot. In 1827 Lieutenant Waghorn, R.N., turned his attention to the establishment of a "steam communication between our Eastern possessions and their mother-country, England," and to his exertions is mainly due the present overland route. Years elapsed before its practicability was acknowledged: Lieutenant Waghorn was obliged to test his plan by repeated journeys to and fro, at his own risk and expense, and in the teeth of a determined opposition. A parliamentary committee condemned the project, and the Chairman of the India Company declared "that they required no steam to the East at all." Nevertheless, Lieutenant Waghorn at last succeeded in making the feasibility of his route to India apparent to the meanest capacities. The following despatch, sent by the Indian Government in September, 1836, will show the estimation in which a comparatively rapid means of communication with the mother-country was held in India:—

"We beg to offer to your Honourable Court our congratulations on the rapidity with which your wishes have of late been conveyed to all parts of your Indian possessions. The three last overland mails have brought despatches from London to Bombay in 58, 45, and 64 days, and those intended for Calcutta have been forwarded in 10 days. We have witnessed the energetic impulse this early intelligence has given to the mercantile interest, and the unbounded satisfaction it has diffused throughout all classes of the community. It is, indeed, undeniable that a quick interchange of information is of the first advantage in commerce, and in the conduct of all public business; while it is equally true that its effect on the minds of those who serve the Honourable Company long and faithfully in this distant land, is to deprive the painful feeling of separation from their homes and country of half its bitterness. We beg respectfully to press these reflections on the notice of your Honourable Court, with our earnest prayer that you will, ere long, grant to India the much desired boon of frequent and regular communication with Europe by the employment of a sufficient number of steam-vessels for that purpose."—*Porter's Progress of the Nation*, p. 320.

The "Overland Route" being an established fact, attention was soon directed towards its improvement, which has since been surely, though slowly, progressing. At first, the mails from India to Suez were brought by the ships of the East India Company, but in 1841 a contract was made with the Peninsular and Oriental Company, and since that period no expense or exertion has been spared by them to exceed even the terms of their contract. The next improvement which superseded the tedious and painful journey by Nile-boat, van, and camel, was the completion of a railway, first from Alexandria to Cairo, and then from Cairo to Suez.

This great work has considerably shortened the journey, and, what is more, has found favour even in the eyes of the ignorant Mohammedan inhabitants. It will be interesting to detail briefly the history of these two railways, for, though they form one great line, yet the one is as different from the other as it is possible to conceive.

The construction of the line from Alexandria to Cairo was undertaken by Mr. Robert Stephenson; it was commenced on the 9th of February, 1852; reached the Nile at Kafr Azzayat, exactly half-way between Alexandria and Cairo, on the 4th of July, 1854; and finally entered Cairo on the 1st of December, 1855, having been three years ten months in completing.

There are eight stations; the line is perfectly level the whole way, with only one cutting through the mound of a deserted village, and its entire length is 131 miles. Iron sleepers are used, supported on bells of the same metal, a plan adopted by Mr. Stephenson, as admirably adapted to sustain the rails on the peculiar soil of Egypt.

The difficulty in crossing the Nile was obviated by means of a steam ferry, the striking peculiarity of which arises from the necessity to adapt the floor and rails to the exact level of the railway at each side, under the extreme variation of level to which the waters of the Nile are subject. By an ingenious mechanical contrivance, the platform is raised or depressed as the waters of the Nile require, and this, together with an exact adjustment of the rails and the most perfect facility of access to and egress from the framework, is ingeniously provided for. The entire cost of this ferry amounted to 15,000*l.*

A handsome iron bridge, which will supersede the ferry, is in course of construction, under the direction of Mr. Rouse, C.E., and will be opened for traffic in June next.

The entire cost of the railway-works from Alexandria to Cairo is under 1,000,000*l.*, or less than 7500*l.* per mile. At present, the time occupied in the journey from Alexandria to Cairo is seven hours, but when the bridge at Kafr Azzayat is opened to traffic a great reduction will take place.

The completion of this half of the transit line was hailed with great rejoicing; every difficulty had been triumphantly grappled with: the native Fellahs, owing to excellent arrangements made for their comfort and welfare, had escaped the disasters usually attendant upon the construction of public works in Egypt, and, what is more, so thoroughly understood the utility of the work they were employed upon that, as already mentioned, they actually volunteered to make the embankments for two branch lines, one of which was completed in a year, and will open up the richest part of the Delta. It is the Pasha's intention to employ no one but Arabs upon these branch lines.

It now remained to perfect the transit route by a railway to Suez, and the obvious course the line should take was indicated, viz., to branch off from Benha, by way of Zagazig, through the Ouadee Toumilat (Land of Goshen) and past the Bitter Lakes to Suez. This route possessed two great advantages—a level country the whole way, and the means of obtaining abundance of water. It was, however, urged upon the Pasha that the English had enjoyed the emoluments resulting from the construction of the first half of the railway, and, therefore, to the French the remaining half ought to be devoted; accordingly, the continuation of the line to Suez was intrusted to a French engineer, M. Mouchelet. This gentleman evidently did not consider the route I have just alluded to as the best, for he has carried his line from Cairo due east over the Desert, straight to Suez. Although several cuttings had to be made, no great difficulty was experienced except from the total absence of water, until reaching Gebel Awebel; but after passing that elevated ridge the obstacles met with in the descent to Suez became most serious, the curves which have been made are astonishing, requiring extreme caution to travel over safely, and instead of 90 or 100 miles, the line has in consequence attained a length of 130 miles. Much danger is incurred and unnecessary loss of time occasioned, there is daily expectation of a fearful accident, and last, though not least, owing to the lack of water, the train mileage for water traffic will always be five-elevenths of the train mileage for all other traffic, which will add immensely to the expense of working the line.

Dreadful disasters have taken place in consequence of the want of water, hundreds of Fellahs unable to obtain it have been seized with a panic, and missing their way to the Ouadee Toumilat in search of it, have perished miserably in the Desert. The line from Cairo to Suez was completed on the 7th of December, 1858. It is difficult to make an estimate of the cost, but it cannot be put down at less than 10,000*l.* per mile.

The time occupied on the journey from Cairo to Suez is from 6 to 8 or 9 hours, but the great expenses of working and the risk render it probable that the line will only be used as a temporary means of conveyance. We will now consider the means by which so desirable an end as shortening the road to India may be accomplished.

A passenger leaving Southampton by the "Overland Route," on the 4th of the month, arrives at Alexandria on the 17th. He leaves Suez on the 19th, and arrives at Aden on the 25th; thus, including the 2 days crossing the Isthmus, he is 21 days on the road from Southampton to Aden. Now it is most desirable that the passage of the Red Sea should be shortened, and I propose to do it by continuing the railway along the banks of the Nile as far as Assouan, and thence across the country to Berenice; the total line from Alexandria to Berenice would be 690 miles. At present the journey by railway is 260 miles, and the question is simply whether the remaining 430 can be better performed by steamboat or by rail.

Every one who has travelled on the Red Sea knows full well the suffering occasioned by the intense heat. The inconvenience of the Port of Suez is also well known, the steamers being obliged to lie at least 3 miles off the landing-place. Suez itself is simply a large inn in the midst of the Desert, of use only as an entrepôt for goods.

The delays and difficulties met with on the present line from Cairo to Suez have already been alluded to.

Regarding the present proposition of a railroad from Alexandria to Berenice, if the speed of only 20 miles per hour was maintained, the journey could be performed in 35 hours; add to which 12 hours' rest at Thebes, and it will be seen that the entire passage will only occupy the same time now taken up between Alexandria and Suez: that is to say, the steamer will arrive as usual on the 17th, and the mails and passengers will be at Berenice, which is one third of the way down the Red Sea, instead of at Suez by the 19th, thus saving two clear days in our communications with India.

At Berenice there is a good and safe harbour, with sufficient water to allow the largest steamers to come alongside, and quays made for that purpose; therefore passengers, mails, and cargo could be transferred without the least difficulty or delay from railway to steamer.

The advantages are therefore a gain of two days in time, one third of the Red Sea passage avoided, and a convenient harbour at the end of the line, instead of the miserable Port of Suez.

The time of transit might still further be reduced by the construction of a pier at Alexandria, alongside which the steamers might go in all weathers, and thus avoid the usual delays.

The above advantages apply only to the improvement of the present Overland Route, but Egypt and the entire commercial world would share largely in the benefits of such improvements. For instance, the entire Nile Valley belonging to Egypt would be opened up, and a high road formed conducting to the heart of Africa, the inexhaustible riches of which country remain yet untouched.

Finally, the port of Berenice would be admirably situated for developing the Red Sea trade, which is at present slumbering for want of such an entrepôt.*

The maintenance of our Indian empire in its integrity is of vast importance, and nothing can so surely consolidate the rule of the mother country as a speedy means of communication with her possessions.

Shortening the route to India by two days is, doubtless, a great gain; and, as the time is past when the authorities can assert that "they require no steam to the East at all," it is to be hoped that the attention of those most interested in the matter will be given to the attainment of so desirable an object.

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* Sir Gardner Wilkinson differs entirely from these views, and says that the "Port of Berenice has long since been filled up with sand, and has only a small quantity of water in it, even at high tide."—Ed.

The President.—We have known Captain Pim on various occasions. We recollect him as the gallant Arctic officer who offered to go in search of Franklin across Siberia, and we have known him, indeed, in various expeditions in search of our lost friend and his companions. Again, he is the individual who walked across that great mass of ice to Banks Land, to rescue M'Clure and his companions; for, had not Captain Pim performed that journey, Sir Robert M'Clure might never have revisited this country. We farther know that Captain Pim distinguished himself in the Baltic and in the late war in China, in which he was severely wounded and honourably won his promotion, and now he appears before us as a geographical statist. The paper has a very modest title, but it embraces a variety of important topics. He has analysed the different lines of route across Egypt, whether by railroad or canal, and has laid before us a plan of his own. I do not pretend to compare the merits of these various plans, but I am bound to say that Captain Pim has ably developed the observations and deductions of our very distinguished associate Mr. Robert Stephenson, whose surveys in Egypt are well known to geographers and the public, and who in his last visit was accompanied by the author of this memoir.

General W. Monteith, F.R.G.S.—It is great presumption in me to offer an opinion regarding a great work after the statement made by the able engineer who has lately been engaged expressly in the examination of the proposed Suez Canal. It has always been a subject which I had taken great interest in, and I was convinced of its practicability till I heard from Mr. Stephenson that no difference existed between the levels of the Red Sea and Mediterranean, which I had understood would afford a sufficient current to keep the Canal open. That not being the case, I at once ceased to consider the work practicable, so as to allow large vessels to pass through either loaded or empty. Excavating a canal of any dimensions might be accomplished, but it would lead to no result when it came out on a shallow coast, which would render the Canal inaccessible. It appears from history that at two different periods a communication did exist, and on both occasions the Canal did not go direct to the sea, but joined the Nile; but neither was intended or required for large vessels. This I think offers no considerable difficulty even at present. I have three times been at Suez, and on one occasion I visited a wall or embankment about three miles from Suez (to the east), which was said to have been built by a sultan of Egypt, to shut up the mouth of the canal, to prevent an Arab invasion. Whether this is correct or not I do not pretend to say. The question of a great ship canal is I think set at rest from the deposits left by the Nile to the east of Alexandria. But a small canal, joining one of the branches of that river, though it would not answer as a great point of transit for the world in general, would be a vast advantage to Egypt and the small vessels navigating the Mediterranean, but be certainly no advantage to the trade of England. Any plan which does not include bringing water to Suez will be imperfect, whether by canal or railway, as proposed by Mr. Stephenson. I again apologise for offering an opinion in presence of several so much better able to judge.

Mr. George Rennie, F.R.G.S.—As one of those who dissent somewhat from the opinions of Captain Pim regarding the canal, perhaps I may be allowed to look at the subject in an engineering point of view. I have read the statements of M. Lesseps, and I find nothing in them to justify the assertion that the canal is impracticable. In the first place, that canal is on the most direct line between Suez and the Mediterranean, and, with one or two small exceptions, it is nearly upon the level. Next, with regard to the alleged unfavourable character of the soil, what says M. Lesseps, and what say the borings taken by the Commission? They show a light coat of sand, and below that clay—the very article wanted for the canal. Then, as to the probability of the canal filling up by the flowing of the sand, M. Lesseps and the Commission found the remains of a Roman camp, and a camp of considerable antiquity, also the vestiges of the ancient canal of the Pharaohs, none of which works have been covered by the shifting sands of the desert. As to the expense of the harbours of Pelusium and Suez, the Plymouth Breakwater had been quoted as the datum for the probable cost of the piers at those harbours; but the case did not hold, as the Breakwater at Plymouth was an isolated Breakwater built in the sea, in which every stone had to be taken out in barges and deposited. The cost of that work was about 190*l.* per foot run. But the Portland Breakwater, of a similar area of section, consisting of jetties of stone projected from the shore, cost only 150*l.* per foot lineal. The Marseilles Breakwater, also of a similar area of section, built partly of stone and partly of béton or concrete, cost only 80*l.* per foot lineal; and, as this was the system proposed for the piers of the harbours of Pelusium and Suez, the cost would be less than one half of the Plymouth Breakwater, the circumstances being different in both cases.

The cost of the piers at Pelusium, one 3800 mètres in length, the other 2700 mètres in length, would, if carried out as proposed, not exceed 2,000,000*l.*, while the piers at Suez, of 2700 mètres and 2500 mètres in length respectively, would be proportionately less, or say 4,000,000*l.* for the harbours and 4,000,000*l.* for the canal, making 8,000,000*l.*, as estimated. But, supposing the cost of the whole project to exceed that sum, the object to be accomplished is worth it.

The greatest objection that I have heard is the report of Captain Spratt as to the formation of the Delta of the Nile. He states that the winds prevail from the north-west, and set in such a current upon the Pelusium shore, together with the muddy bottom, as to make it untenable for vessels to anchor in those roads. He also states that the piers would run out into the mud brought to the eastward by the current from the Nile, and thus render the works next to impracticable.[*] There are always two statements of a case, and I hold in my hand a pamphlet entitled 'Observations on the Bay of Pelusium,' by Captain Philigret,[†] who commanded a corvette in the service of the Viceroy of Egypt, and anchored it in that very bay for the purpose of testing in every respect the objections of Captain Spratt; and the results are totally at variance with what has been stated against the bay of Pelusium,—that, on the contrary, the anchorage is good, and that the bottom is sandy, and continues so to a depth of 10 mètres or 32 feet. With regard to the question of distance, M. Lesseps shows that it is not more than half the distance that it is by the Cape route; and he states that he is quite satisfied that a toll of ten francs per ton upon ships passing through is quite enough to pay the interest of the capital. Part of Captain Pim's argument was founded upon the dangerous navigation of the Red Sea. But the time is coming when sailing-ships will be superseded by steam-ships, and the interests of the commercial world will tell you how advantageous it is to take a steam-ship directly through the canal, and convey its unbroken bulk all the way to Bombay or Calcutta, instead of having to take the cargo out of the ship at Alexandria, land it, carry it across to Suez on the railway, and ship it again on the Red Sea. I do not pretend to know anything of the commercial part of the question. I take these statements of M. Lesseps, and I find his scheme has met with unanimous approval at Liverpool, Leeds, Manchester, Glasgow, Dublin, and all the great commercial towns of England. Again, I cannot understand why this project should be pronounced impracticable after it has undergone the investigations of a Commission consisting of the first authorities in Europe. It is not likely these men would compromise their characters by asserting the possibility of a scheme which is now declared by the author of this paper to be impossible. I therefore think that simply as an engineering question the statements of Captain Pim, as to the impracticability of that canal, are at variance with the facts stated by M. Lesseps and verified by the Commission.

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[*] The International Commission propose that the Pelusium entrance should be placed 20 miles nearer to the Nile, and thus to shorten the piers.

[†] Observations Hydrographiques dans la Baie de Péluse, par M. le Capitaine Philigret, Commander of his Highness the Viceroy's steam frigate *Feez Djahd.*

Mr. S. Sidney said,—The question was one which could not be settled without the consent of England. British exports and imports in the port of Alexandria averaged nearly 4,000,000*l.*, or more than those of all the other nations trading there put together. British passengers paid for transit across the Isthmus upwards of 200,000*l.* per annum. British merchandise and specie were sent across here to the value of upwards of 28,000,000*l.* England is the only country that received duty free the whole produce of Egypt—grain, pulse, and cotton. Egypt was the road to India. The "gate of our house" old Mehemed Ali called it, and the Isthmus "the key of our gate."

It did not require arguments to prove that if it were possible to cut a real Bosphorus across the Isthmus, through which our great ships could sail or steam without interruption, it would be an enormous advantage to our commerce, putting out of sight the political and military consideration that it would be an additional strait for us to watch and defend.

But, if a deep and open Bosphorus would be a commercial advantage, a shallow ditch, open only to flat-bottomed boats, useless for trade, but available for the *coup de main* of an invading army, was a thing to be resisted with all our strength. The piercing of the Isthmus of Suez was essentially a geographical question, and therefore eminently fitted to be discussed by the Society. It was not new; it had been discussed for sixty years, and, according to all the reliable evidence, it was impracticable. He also (Mr. Sidney) was prepared, but would not add to the picture drawn by his friend Captain Pim, of the Mediterranean, driven by north-eastern winds for nine months of the year on the long, low, flat, shallow, surf-beaten shores of the Delta; for ages on ages barren, treeless, devoid of every kind of material needed for construction by an engineer. But, in reference to the scheme of running out on the soft sand of the Pelusium shore two stone breakwaters of a united length of between six and seven miles, every stone to be brought either by sea from Valencia in Spain, or from Rhodes in Egypt, or 90 miles inland, with neither railroad nor common road for conveyance, he would remind the Society that at Plymouth, with stone close at hand, a breakwater 1¼ mile had taken twenty-eight years to construct, and cost 1,500,000*l.* sterling; Cherbourg, 2¼ miles, had cost 3,000,000*l.*; Portland, years in progress, was still proceeding bit by bit. And these works were executed with all the advantages of labour, fuel, food, and all the appliances of machinery to be had close at hand for money. At Pelusium every labourer, every ounce of food, every stick, every stone would have to be imported, and money loved not either labour or time. But, leaving the difficulties of founding a port on a delta to be dealt with by engineers, leaving them to treat of the Sisyphyan task of dredging a deep channel in a soft flat, in the face of a never-ceasing current, he would step on shore and tell them what was the experience of the celebrated Frank-Egyptian engineers in cutting canals through such swamps as Lake Menzaleh—the swamp through which was proposed to dredge twenty-five feet below the level of the Mediterranean. They say, in their Avant Propos, reporting to the Viceroy:—"It appears to them impossible to maintain in proper repair a canal, the bottom of which was below the line of low water in the Nile, otherwise than by an enormous expenditure; and even if incurring this cost, it was uncertain whether the desired result would be obtained. In all cases where an attempt has been made to dig a canal below the low-water level, and more especially on the outskirts of the desert, in the Ghattat-Bey, for instance, it invariably happens that at about the level of low water a bed of loose sand is met with, as was the case at Masteroud on the Zafranieh. This constitutes an enormous difficulty and a source of expense, of which it is hardly possible to form any previous estimate. When even it is not sought to obtain any great depth below the level, 0·50 mètre (1′ 7¾″) for instance, annual dredgings of a really formidable nature are required. Thus in the Ghattat-Bey, the labour of 30,000 or 40,000 men is required for the space of a month to clear out the feeder at the point of junction; in the Chibin, from 20,000 to 30,000 men are employed; and from 15,000 to 20,000 for the Chercaouieh. In the case of the Moëze, all attempt to dredge it has been given up. To justify the withdrawal of so considerable a number of hands from the ordinary employments of agriculture, nothing short of absolute necessity can be admitted—a great damage to the resources of the country is thus occasioned, and so serious a result should, if possible, be avoided."

But it was not given to every one interested in this question to visit Egypt, to travel on foot or by camel over the disputed land, and see the sands, the swamps, and the flat Pelusian shores with their own eyes. The general public must form their opinion on evidence, and not by the number but the quality and the qualifications of the witnesses. The feasibility of the route originally rested on the theory of the Red Sea being thirty feet above the Mediterranean, and thus affording a headwater sluicing power to wash out a channel and keep a clear way through the artificial harbour proposed to be built at Pelusium. While that theory prevailed in 1835, General Chesney in 1843, Captain Vetch, and Mr. Anderson, of the Post-office, a successful merchant, but no engineer, all three supported the proposal for cutting through the Isthmus. But, as Captain Pim had related in 1847, M. Talabot, Mr. Robert Stephenson, and Mr. Negrelli, an Austrian engineer, having contemplated embarking in an undertaking for cutting a canal between the two seas, began by examining and levelling the route. Then, before this exact examination, the myth of the Red Sea headwaters disappeared, and the scheme of the canal naturally disappeared with it. M. Negrelli appeared convinced, for he was silent for nine years; M. Talabot printed a report, in which he exhausted every branch of the subject in an historical, geographical, and engineering point of view, and decided that the idea of a salt-water canal, since proposed by M. de Lesseps, was an absolute absurdity. And it was his (Mr. Sidney's) firm opinion that, if M. Talabot's work had been circulated in a popular form in the three leading European languages, the project of the Isthmus of Suez Bosphorus would long since have been consigned to the limbo of unfortunate projects. In 1851 Mr. Stephenson, before the Institute of Civil Engineers, publicly pronounced the canal scheme impracticable.

In 1856 the Suez Bosphorus scheme was again examined by two of the International Commissioners, Mr. M'Clean, who was living, and his (Mr. Sidney's) late lamented friend Mr. Rendel, one of the Presidents of the Institute of Civil Engineers, Consulting Engineer to the Admiralty, and Engineer of several Breakwaters and Harbours of Refuge. Mr. M'Clean visited Egypt, and, conjointly with Mr. Rendel, prepared a detailed report on the Lesseps plan, and concluded in the following words as to the harbour of Said:—"No dredging can take place until a temporary harbour has been constructed, as it is a lee shore for nine months of the year. There will be no breakwater to keep the channel open: on the contrary, there will be a gradual flow into the canal, which will tend to form a new beach in the harbour and canal. There will be no certainty that the work will *ever* be finished. It will altogether depend on contingencies, over which the engineer has no control, and which cannot be estimated. Therefore the construction (under M. Lesseps' system) *may be regarded as impracticable.*"

Thus, then, in 1847, a French, an English, and an Italian-Austrian engineer abandoned the scheme as impossible when they discovered the mistake on which Napoleon's scheme was founded; and thus in 1856 M'Clean and Rendel, after mature examination, fortified by the local evidence of the Egyptian engineers, agreed with Talabot and Stephenson. But Mr. Stephenson was present, and would doubtless give the result of his repeated personal examinations. He would speak with all the force of high scientific acquirements and more than thirty years' labour on public works on lands, on rivers, and on seas, the greatest, the most novel, extraordinary, and successful that had ever been attempted in ancient or modern times.

MR. DANIEL A. LANGE, F.R.G.S.—The discussion this evening on the subject of the Suez Canal cannot fail to be of the highest importance, as expressing in how far the feelings and opinions of Captain Pim and some Fellows of this enlightened Society are in accord with the Academy of Science in Paris, and other eminent engineers, on the subject of the Suez Canal. Appreciating as I do the full weight and learning which is brought to bear upon all questions submitted to its discussion, and aware also of the interest, I may almost say excitement, which is felt in Europe on all matters connected with it, I hope the few observations I have to make may not be considered unworthy of your consideration. There is one point I would rather not have touched upon—it is the engineering question. I am aware that there has been much warm feeling and controversy about the different opinions held by the engineers; but it is one which, having been gone into this evening, I cannot well pass over, and as Mr. Stephenson is here, he will correct me if I fall into any unintentional misstatements. I have no wish to entangle myself in any scientific controversy between the eminent engineers who now take part in this discussion, and will leave to those competent to deal with such matters the task of enlightening the public on this important question; but, for the benefit of the uninitiated and those who may not have had time or inclination to wade through the different opinions held by opposite parties, I have deemed it not ill-timed to place the point at issue as simply and clearly as I can before you. Mr. Robert Stephenson holds the opinion—and, whether rightly or wrongly, it is not for me to decide—that after it had been ascertained beyond a doubt that no difference of level existed between the Mediterranean and the Red Seas, the project for cutting a canal through the Isthmus of Suez became impracticable. On the other hand, engineers of equal eminence state just the reverse, and view the non-existence of any difference in the level between the two seas as the very circumstance which will render its construction perfectly feasible. Now the question arises, who is right? And you will have to deal with the evidence before you. You must either pin your faith to one or other party, and make your choice between the opinion held by Mr. Robert Stephenson and that held by other engineers. Either Mr. Stephenson is right and they are wrong, or their collective opinions are of greater value than that of Mr. Stephenson. You will have to judge for yourselves, and my object in bringing this matter before you is, with an earnest desire for truth, to endeavour to state, as impartially as possible, the full value of the evidence with which you have to deal. The lateness of the evening prevents me from entering fully into the objections raised, and which have been so ably met by Mr. Rennie; but I wish to hand in the following condensed statement of the opinions already alluded to,* and I think I cannot do better than refer to the "Report" itself of the "International Scientific Commission," copies of which, together with an atlas showing the configurations of the Isthmus, have been presented to the Society. From these elaborate works it will be seen that every possible contingency likely to occur, and every objection likely to be raised, has been fully anticipated and met. I may farther mention that, since the period of its publication, increased labour and study has been devoted to this important undertaking; that specimens of the borings along the whole track through which the canal will have to be made can be seen at the Geological Museum at Paris. I beg it will be distinctly understood by the present meeting that, although I represent the Company in this country, I have not taken part in this discussion with the object of making proselytes with a view of engaging their financial co-operation. The time for this has passed, and the list for subscriptions was closed on the 30th of November last year. The capital subscribed, and the amount of calls required, have been paid up. I think this statement due to myself in order to dispel any notions, which I do not believe exist here, that I have entered into this discussion with any other motives than to endeavour, however inefficiently, to refute on purely scientific grounds the arguments which have been put forward against the execution of the canal. In conclusion, I can only say that I believe all arguments respecting the feasibility of the undertaking have been placed beyond the pale of controversy: nevertheless I shall be happy at all times to afford any information which it is in my power to give to this Society. I consider that we have now arrived at the time for practical operations. Mr. Ferdinand de Lesseps, accompanied by the contractor of the works and a staff of engineers, is at present in Egypt, employed in staking out the ground through which the canal will have to be cut. Ship-loads of timber and other materials have already left the port of Marseilles for Egypt, and all the preliminary steps are being taken for commencing the works; and I earnestly trust that, before six years have elapsed, this great problem, which has occupied the minds of men for centuries, may be finally and successfully solved for the benefit of all nations.

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* *See* p. 203.

Mr. Robert Stephenson, M.P., F.R.G.S.—I entered this room with a firm determination to avoid all controversial points, and with a sincere intention of conveying to you the impressions I received as to the physical geography of the country, after having twice walked over it, which I conceive render the completion and maintenance of this undertaking absolutely beyond the power of man. Now, the most remarkable statement I ever heard of was the one urged just now, that there being no difference of level between the two seas really rendered the thing more practicable than ever. Negrelli, Talabot, and I were induced to begin the investigation, from its being stated as a positive fact that there was a difference of 30 feet in the level—a circumstance which would have offered the only chance of the scheme being practicable. Now, we hear to-night that there is no difference of level at all, and that this makes it more practicable than ever. Can you conceive anything more absurd? I cannot. I was astonished at the assertion of my friend Mr. George Rennie as to the breakwater at Pelusium, and comparing it with the Portland breakwater. Why, at Portland the stones are carried out from the shore and thrown into the sea; but at Pelusium there is no shore, and all the stones must be brought a hundred miles. Is there any comparison between a breakwater at Portland and a breakwater in the Mediterranean on a lee-shore, where there is no stone and no foundation whatever? It is nothing but the silt of the Nile. The Nile brings down millions of tons of mud, and in course of time had thus formed the delta at its mouth. This delta has protruded itself a long way into the sea, owing to the contrary action of the current of the Nile and its branches on one side, and of the current of the Mediterranean along the shores of Africa on the other. The moment, then, that you construct a harbour at

Port Said, and project piers out into the sea, you immediately arrest the course of the mud, and you will never be able to keep the port open. It is the most extraordinary thing in the world to project two jetties into an open sea on a lee-shore, which has for almost three-parts of the year a north-west wind blowing upon it. A steamer even, in a rough sea, dare not enter between two piers 300 feet apart; there is no seaman, except in fine weather, who would venture to approach such a place. To render it at all accessible and safe, there must be a harbour of refuge made, and we know from experience in our own country what a large question this would open up. Really, the physical difficulties are as I believe insurmountable. Supposing the harbour were made, it must be a mere mud trap. The current carried the mud of the Nile in an easterly direction, and if you erect a harbour of refuge, which means a quiescent harbour, it will become a mud trap. That is the peculiarity of all deltas. I believe it to be nearly true, if not absolutely true, that there is no large harbour in the world maintained on the delta of a large river. I know the delta of the Rhone, the delta of the Po, and the delta of the Danube, and I know the delta of the Nile. They are all alike incapable of maintaining a harbour of refuge, or even a good harbour of entrance; the harbour would absolutely be filled up in a few years. And with respect to the canal itself, now that it is proved there is no difference of level, it would really remain a stagnant ditch, and must ever remain so. Whoever has travelled over that district, and seen the moving sands, must see that it would be necessary to dredge, not only the harbour, but the canal itself.

Mr. Lange's *Statement.* See p. 201.

"The very existence of Holland depends upon the engineering skill displayed in works of this description, and M. Conrad, after devoting a whole lifetime to them, holds under the Dutch Government the office of chief engineer of the Water Staat. Surely the opinion of such a man must be of value, and we are naturally curious to ascertain what views this gentleman entertains as to the feasibility of making the canal. It appears that M. Conrad, after bestowing more than two months of his valuable time to a very elaborate personal survey of the entire tract, returned from Egypt with views diametrically opposite to those expressed by Mr. Stephenson, and considers the non-existence of any difference of level between the two seas as a circumstance which will greatly facilitate its construction, and render it easy of execution. But if there could exist any wavering or hesitation in the mind of the public, I apprehend that the opinion of another engineer, not less eminent than M. Conrad, would in a great measure tend to remove it. I am alluding to M. de Negrelli, who holds the highest functions in Austria as an engineer. M. de Negrelli shares unconditionally the views held by M. Conrad. But the evidence does not end here; we have on record the opinion of Signor Paleocapa, Minister of Public Works in the kingdom of Sardinia, whose experience in the construction of jetties and canals leaves no doubt as to the value of his testimony.

"But lest all this should not be considered sufficient, the opinion of M. Lentze, Chief Engineer of the Works of the Vistula, backed by that of the late M. Lieussou, Hydrographical Engineer to the Imperial Marine of France, endorsed by M. Renaud, Inspector-General and member of the Council for Ponts et Chaussées of France, and supported by M. Rigault de Genouilly, Rear-Admiral of the Imperial Marine of France, and Captain Jaurès, of the Imperial Marine, and member of the Council of the Admiralty of France, will, I think, in the opinion of this impartial tribunal, be considered sufficient to induce you to pause ere you surrender judgment to the views entertained by Mr. Stephenson, in opposition to those shared by the eminent engineers I have mentioned.

"The opinions of the late Mr. Rendel and Mr. M'Clean are opposed to Mr. Robert Stephenson's plan.

"Messrs. Rendel and M'Clean proposed to construct a ship canal in nearly a direct line between Suez and Port Said. The level of top-water throughout the whole length (93 miles) to be 23 feet above low-water of the Mediterranean Sea. The embankment to be carried into the deep water of the sea at each extremity, so as to avoid the necessity of dredging, and the locks to be constructed similar to the sea lock of the Caledonian Canal. Mr. George Rennie considers the cutting of the canal, as proposed by the engineers of the International Commission, perfectly practicable. It will therefore be seen that there exists in this country a great variety of opinion as to the precise mode in which the cutting should be effected.

"Captain Pim alluded in his paper to the great mortality caused by the making of the Mahmoudieh Canal, with what I considered questionable policy, seeing that if the argument holds good against the canal, it must necessarily do so with equal force against his own plan for a railway; but lest the example he has so prominently brought forward should cause the construction of canals or railways in Egypt to be viewed with disfavour, I willingly, in our joint justification, came forward with a few facts which, I hope, will effectually tend to dispel the fears his paper may have engendered on these points, and I shall do so with reference to the very Mahmoudieh Canal in question.

"On the 10th of April, 1856, 115,000 men commenced the work of cleansing, and the canal was re-opened for navigation on the 5th of May. The cleansing of the great Mahmoudieh Canal has been accomplished in less than three weeks. For some time back it had been getting choked up with mud, and although the traffic upon it was extremely active, it was becoming somewhat difficult. It was reported that his Highness the Viceroy would appear personally on the scene of action; and the work, confided to almost innumerable multitudes, was carried through with marvellous rapidity. Nevertheless the canal is not under twenty leagues in length and very wide; but the work had been systematically apportioned, and each working party was allowed to withdraw as soon as the portion of the task assigned to it was completed. The food, moreover, was good, and all passed off for the best.

"There was no less than 3,000,000 of cubic mètres of muddy sediment to remove from the bed of the canal, which used to form a carriage road, 10 mètres in breadth, between Alexandria and the Nile. The work had to be completed in haste in order that the workmen might return to their villages and reap the harvest, which becomes ripe towards the end of April. The time to be taken up in the work was accordingly fixed at one month, and the number of workmen to be employed at 67,000. The governors of the various provinces, appreciating the necessity for saving time, supplied more than 100,000 workmen, who had to be prevented from working through the night.

"The work was completed in twenty-two days, notwithstanding the number of subterraneous springs, and the difficult nature of the material to be dealt with, and notwithstanding, moreover, the falling in of a considerable part of the walls of the canal. The great Mahmoudieh Canal may be looked upon as an entirely new work from its increased width and greater draught of water, and the excellent road running beside it.

"Although the task came quite unexpectedly, and the workmen toiled with ardour in the midst of water and mud, the number of sick did not amount to more than five in a thousand, and the workmen were always well supplied with necessaries, a circumstance which forms a striking contrast with what occurred at the first digging of the canal, when more than 20,000 men perished through the deficiency of provisions, water, and proper tools, and the unskilful distribution of the work.

"The Fellahs possess a positive talent for all descriptions of earthwork; for centuries past they have displayed this peculiar aptitude, and there is a good reason for it, for without canals Egypt would be nothing, and neglect of them would condemn her to barrenness, poverty, and famine. No Europeans could get through work of this description in such a climate. Although they are stronger and better skilled than the Fellahs, it is an undoubted and established fact that a European population could not continue to exist here; the first generation of foreign settlers manage to adapt themselves tolerably well at first, but they languish in the end, the second becomes very nearly exhausted, and the third dies out altogether. This is an incontestable fact.

"Captain Pim states 'that towards the Bay of Pelusium the depth of 25 feet of water extends for a distance of more than three miles from the shore. That the prevailing winds, exposure of the Bay of Pelusium, the lowness of the coast, and the absence of land-marks, increase the danger of navigation.'

"'That the quantity of alluvium carried by the easterly current in the Mediterranean, towards the Bay of Pelusium, would have the effect of choking up any harbour or channel which might be made.'

"Now I beg to observe that in 1857 the Commission of Engineers fixed the outlet of the canal at 28¾ kilomètres (17 miles 6¼ furlongs) westward of the point adopted in the project; the shore being there less exposed to the prevailing winds, while it is steeper, and projects farther towards the open sea. Nearer to the N.W., in the Bay of Dibeh, and under the point of Damietta, a vessel could not right herself by a N.E. wind. Moreover, the length of the canal would be uselessly extended. The projection formed by the shore opposite Said, between the Bays of Pelusium and Dibeh, evidently offers the most favourable site; it will be easy to stand out, whatever wind is blowing, and a vessel caught suddenly in a gale of wind from the offing, at this part of the coast, can always right herself and get out into the open sea again.

"The local winds are extremely regular, and the anchorage on the coast of Egypt is better than any one to be found throughout the entire coast of Syria, which is directly exposed to the prevailing winds from the N.W., whereas the Egyptian coast is partially sheltered from them. The holding ground is everywhere excellent.

"M. Larousse, during his sojourn in the roadstead of the Bay of Pelusium, frequently observed the ship's position at intervals, and found no difference, although it had been blowing all night. If it were desired to bring a vessel to anchor previous to entering the canal, there would be no fear of her dragging her anchors. The native coasters declare that in rough weather they easily obtain shelter eastward of Damietta, in the very locality where the canal is to terminate. It should, moreover, be remarked, that previous to the establishment of Austrian and French companies for steam navigation, the coasting vessels engaged in what was called the Caravan Trade, on the coast of Egypt and Syria, frequently sought shelter in the western part of the Gulf of Pelusium. This is sufficient proof that these coasts are far from being so formidable as they were imagined to be in the absence of any positive knowledge of the facts; and it may be taken for certain that a vessel, sheltered from the W.N.W. winds, could keep her moorings with long cables during all weathers in water of 12 mètres (39 feet) depth.

"In farther confirmation of these facts, I beg to call the attention of the meeting to the report of Captain Philigret, entitled 'Observations Hydrographiques dans la Baie de Péluse.' Captain Philigret was purposely stationed on board a corvette, belonging to his Highness the Viceroy of Egypt, during three of the worst months in the year, in the Bay of Pelusium, in order to ascertain the safety of this roadstead and make observations respecting the winds and currents.

"At Port Said the western or northern jetty would be 3500 mètres (3827 yards) long, in order to reach a depth of 10 mètres (32 feet). That on the eastern or southern side would only be extended to a depth of 8·50 mètres (28 feet). Its length would be 2500 mètres (2734 yards). Their general direction will be from S.W. ¾ S. to N.E. ¼ N., and the extremity of one will be slightly deflected, so that the tangent of the two heads should lie exactly S.S.W. and N.N.E., and be exactly 1000 mètres in length (1093¾ yards).

"Subsequent investigations have, however, induced the engineers to dispense in a great measure with the length of these jetties, the nature of the sand being sufficiently firm to admit of dredging operations being successfully performed.

"By this means a sheltered roadstead, or outer port, would be formed, embracing a superficies of 40 hectares (98 acres), perfectly sheltered from the N.W. winds which prevail along this coast, and bring with them the greatest part of the storms. Vessels will be enabled to enter in all weathers, which is the essential point; and there will, besides, be a sort of inner road formed by the roadstead between the jetties. The length of this roadstead will be 1800 mètres (1968¾ yards), measuring from the extremity of the southern jetty, by 400 mètres (437¼ yards). This would form an additional space of 72 hectares (177 acres 3 roods), in which vessels would find shelter and smooth water.

"With regard to what Captain Pim states as to the mud of the Nile, I have to say that is a question to which the attention of the engineers was directed with more than usual care. One fact is perfectly certain, no traces of mud are to be found along the shore, and the sand upon it is as pure as it is fine. This sand extends along the bottom, without any admixture, to a depth ranging from 8 to 9 mètres (26 to 29½ feet). The mud does not commence until beyond this range, and it is only at a depth of 10 mètres (32 feet 8 inches) that pure mud is found, and from thence it stretches out to an indefinite distance in the depths of the Mediterranean. Though here and there a few patches of mud may occur at a less depth, they are of insignificant dimensions, not exceeding 10 to 15 mètres (32 to 49 feet) in diameter, and 0·25 to 0·40 mètres (10 to 15 inches) in thickness. Such deposits are recent and superficial, and have not been subjected to the effects of a storm; they are of purely accidental occurrence, and the first gale of wind from the north would entirely disperse them."

Eleventh Meeting, May 9th, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*Capt. C. C. Chesney, R.E.; Capt. K. R. Murchison; Consul W. T. Pritchard; and E. Rawdon Power, Esq.; were presented upon their election.*

ELECTIONS.—*L. C. Bailey, R.N.; R. Fisher, M.D.; and John Reeve, Esqrs.; were elected Fellows.*

EXHIBITIONS.—Several Maps and Plans of fortified towns, &c., in Italy, presented by the Government of Rome; and Maps of United States Harbour Improvements on Lake Michigan; were exhibited.

The Papers read were:—

1. *Notes on the Lower Danube.* By MAJOR STOKES, R.E.

Communicated by CAPT. R. COLLINSON, R.N., F.R.G.S.

THE "lower" portion of the Danube begins at the Iron Gates, and has an entirely different character to that of its upper course. It spreads into many channels whose banks and beds change yearly and even monthly,—a cause that renders charts of little value to its navigators. The vessels used in the river seldom draw more than 4 feet, and even that is too much for the Iron Gates in autumn. Sea-going vessels rarely, if ever, pass Oltenitza.

The final subdivisions of the Danube are as follows: 1st, the Kilia branch, which contains $\frac{17}{24}$ths of the whole river. It forms a delta of its own, and enters the sea in five principal channels; 2nd, the St. George's branch, which contains $\frac{4}{24}$ths; and, thirdly, the Sulina branch, which contains the remaining $\frac{3}{24}$ths. The Sulina is the only navigable outlet; but the St. George would be a far better one if the bar that obstructs its mouth were removed or turned by a canal. For the St. George is broad and deep up to its very mouth, while the Sulina is narrow and obstructed by shoals.

The land between Galatz and the head of the delta is marshy and reed-grown, and decidedly lower than the banks of the river, except at those points where spurs of the Dobrudscha mountains or portions of the steppe extend to them. Inundations occur every five or six years. The Delta itself is rarely, if ever, flooded; it is covered with a dense mass of reeds, and on its higher parts with forests of ash and stunted oak. There are data by which the rate of increase of the Delta may be measured, for a map is in existence, of the date 1769, in which the Kilia branch is made to enter the sea at the point where we now find the Wilkowi Basin—that is to say, at *five miles* from its present mouths. Again, there is another Russian plan, without date, but giving the city of Odessa, which was founded in 1796, and which represents the mouth of the Kilia at the same place, but indicates the commencement of a formation of islands in front of it, which seem to be the ground-work of the present Kilia delta. There was an actual survey made in 1829–30 by the Russian Government, and another by H.M.S. *Medina*, under Captain Spratt, in 1857. The delta had increased 4000 feet in that interval of time, and the line of 4-feet sounding had advanced in a still greater proportion. Many statistical details are appended to the paper, and arguments in favour of the various plans proposed for improving the navigability of the river are discussed.

MR. HAMILTON, F.R.G.S., said: In rising to address a few words to you, Sir, upon this subject, I do so with the view of recommending those who have heard the paper read not to place too much confidence in that brown dotted line which has been stretched across that map as the limit of the sea-shore in the year 1769; because it is absolutely impossible, when we look at the amount of matter brought down by other rivers, and which has tended to the formation of the deltas of other rivers, that we can look upon this movement—this new matter which has been added to the coast during the period in question (since 1769)—as in any way giving us a rule respecting the question of increase in the deltas of rivers under ordinary circumstances. Looking at it in that point of view, therefore, the impression which has been left on my own mind is this:—that, either the maps that give us the coast-line in the year 1769, as exhibited by that dotted line, are exceedingly faulty, or that, if that really were the line of coast at that period, it must have been owing to some abnormal state of things; and that, owing to a change of currents, or to earthquakes, or to other causes, into which we are not at present capable of entering, the line of coast was not then in its normal state; and that subsequently it has returned to that which may be considered its normal state. This may be the result of two causes: first, the matter brought down by the Danube; secondly, the prevailing winds of the Black Sea, which during the summer are from the eastward, and would, therefore, tend to collect a great amount of matter along that coast during a given period. I think that the increment given during this period of 80 or 90 years is somewhere about 18 or 20 miles. If we look at the increase of the deltas of other great rivers—such, for instance, as the Ganges, the Mississippi, and rivers of that class—we find that the increase here stated is altogether out of proportion to anything we are acquainted with in those rivers; so much so, indeed, that I can only look upon it as altogether erroneous. I dare say that those gentlemen who are acquainted with the old writers will recollect the oracular verses quoted by Strabo with respect to the Pyramus, one of the rivers in Asia Minor, which brought down such an enormous quantity of sand and mud that its delta was expected to increase to an enormous extent:—

Ἔσσεται ἐσσομένοις ὅτε Πύραμος ἀργυροδίνης
Ἠϊόνα προχέων ἱερὴν ἐς Κύπρον ἵκηται.

The meaning of which was, that a time should come in future generations when the delta of the Pyramus should be increased to so large an extent by the mud brought down from the interior, that it should stretch along the sacred land of Cyprus. Now we know that the delta of the Pyramus has not increased one mile since that was written. Therefore, I must warn those who have heard this paper read against looking upon this increment as anything like the normal state of increment which is to be expected as resulting from the matter brought down by any of the great rivers of the globe during the period that has been referred to.

The Second Paper read was:—

2. *Observations on the Geography of Central Africa.* By JAMES MACQUEEN, Esq., F.R.G.S.

MR. MACQUEEN cites in his paper the authorities that exist on the subject of the Upper White Nile, and on Kilimandjaro, with a view of proving that the latter mountain is undoubtedly snow-covered; and that, on the other hand, it has no connection with the river. He repeats the well-known description of Rebmann, who, during a period of two months that he spent in its neighbourhood, saw Kilimandjaro every day that it was clear, and even passed some time within five or six miles of the snow-covered part; and who, in further corroboration of the existence of snow, mentions how the natives described the melting of the white material before the fire, &c., &c. Krapf, who also saw the snow, speaks of the river issuing from it as running to the eastward: he also gives the report of a large river lying far to the N. W. of the mountain, and presumed to be the Nile.

Turning to the White Nile, we have the accounts of the two Egyptian expeditions, the first of which appears to Mr. Macqueen to give the most reliable latitudes; it reached 3° 30′ N. lat. and 31° E. long. from Greenwich, where it was stopped for want of water on Jan. 26, 1840. At that time the breadth was 1370 feet, and the greatest depth from 3 feet to 6 feet. Here the country had begun to be rocky, and the vegetation to be European in its character. Werne's information of the second Egyptian expedition is sufficiently corroborative. Dr. Knoblicher finds the river at Loquek to be 650 feet broad in the dry season, and from 5 to 8 feet deep. From Loquek to the farthest known point, that of Don Angelo is the best account: he was there in 1852. He describes the cataract of Garbo in presumably N. lat. 2° 40′. Sixty miles beyond this is Robingo, and then Lokoya, where an affluent runs in from the east. Beyond Lokoya the White Nile is a small rocky river.

The reports collected by travellers, such as Bruce and Harris, are then discussed, and afterwards those of Ptolemy. The paper concludes with the following account of the recent statements of M. Leon:—

"Some very curious and important information connected with the countries near the sources of the Nile has just been received from a French missionary (Père B. P. Leon), dated at Zanzibar, August, last year. This missionary had been in Enorea. He states that there is a frequented road from Brava on the sea-coast to Kaffa, the journey occupying 24 days. This, by mature estimation, is about 15 miles daily, but they never actually travel more than 10 miles on an average. The estimated distance is 360 geographical miles, which is tolerably accurate. Twelve days' journey south of Kaffa, he states, dwell a people called Amara, nearly white: they have written books, and a language different from either the Ethiopic or Arabic. They build houses and villages, and cultivate the ground. They are rightly conjectured to be the remains of Christian nations which in early times spread far to the south of Abyssinia, till they were overrun, massacred or scattered, by the savage Galla. It has been repeatedly asserted that such remnants of Eastern Christian Churches were scattered over this portion of Africa. Four days' journey from the Amara M. Leon says there is a lake, from which an affluent of the White Nile is seen to flow. M. Leon supposes this to be the source of the Sabact, but it is more probable that it is the main stream of the Nile.

The Amara, he says, dwell between 2° and 3° N. lat., and have some tribes of copper-coloured people, who dwell near the equator, subject to them. No Mussulman can venture to enter this country."

The PRESIDENT introduced Captain Speke to the Meeting, and explained that he had within the last two days only returned from the place to which Mr. Macqueen's paper more particularly had reference; and could therefore supply some useful information.

CAPTAIN SPEKE, F.R.G.S., said: After arriving at Zanzibar, we had to wait a considerable time, some months, until the masika, or rainy season, would be over, before we could penetrate into the interior. It was generally advised that we should do so. During the interim Captain Burton and myself made a short coast tour, first to Mombas, and then proceeded down the coast to Pangani. Leaving that place, we ascended the Pangani river, and arrived at Chongwe, a small military station belonging to Prince Majid. Here we were supplied with a small escort of Belooch soldiers, who accompanied us across some hills, by an upper route, to Fuga, the capital of Usambara, where we were hospitably entertained by King Kimwere, a great despot reigning there. After visiting him for one day, the shortness of our supplies compelled us to retrace our steps by a forced and rapid march, following down close along the banks of the same river until we again arrived at Pangani. Thus ended our initiatory tour in Eastern Africa. The rainy season or masika was spent by us at Zanzibar, in constructing the equipment of a caravan. There is a singular tribe of negroes in the interior of Africa, called Wanyamuezi—the literal translation of which signifies people of the moon. These strange people are professionally voluntary porters: they annually bring down ivory to the coast in barter for themselves, or otherwise for the Arabs. At the close of the rainy season Captain Burton and myself left Zanzibar, with a caravan mustering about eighty men; having previously sent on some supplies in anticipation of our arrival. Unable to collect a sufficient caravan for the conveyance of our kit, we purchased a number of donkeys (about thirty). Thus completed, and with an escort of twelve Belooch soldiers, given us by Prince Majid, we commenced our journey westward, and arrived (by slow degrees travelling over a low alluvial plain, up the course of the Kingani river) at Zungomero, a village situated under the coast range, which struck us as bearing a good comparison with the western ghauts of India. We might call this range the Eastern Ghauts of Africa. There we were detained by severe illness a considerable time. Afterwards we crossed these eastern ghauts, the maximum altitude of which I ascertained to be about 6000 feet. On the western side of this longitudinal chain of hills we alighted on an elevated plateau, an almost dead flat, ranging in level from 3000 to 4000 feet above the sea. Here we had cold easterly winds, continuing through the entire year. Proceeding onwards, we arrived at the Tanganyika Lake, called by the Arabs Sea Ujiji, a local name taken from the country on the eastern margin of the lake, whither they go to traffic for ivory and slaves. This lake is in a singular synclinal depression; I found its elevation to be only 1800 feet; whereas the surrounding country (the plateau), as I said before, averaged from 3000 to 4000 feet. The lake is encircled at its northern extremity by a half-moon shaped range of hills, the height of which I estimated (for I could not reach its summit) to be at least 6000 feet. They may extend to a height much greater than that; however, we could not take any observations for determining it. After exploring this lake we returned by the former route to Unyanyembe, an Arab depôt, situated in latitude 5° south, and about 33°

east longitude. My companion, Captain Burton, unable to proceed farther, remained here; whilst I, taking just sufficient provisions for a period of six weeks, made a rapid march due north, to latitude 2° 30′ south; and there discovered the southern extremity of the Nyanza, a Lake, called by the Arabs Ukerewe, a local name for an island on it, to which the merchants go in quest of ivory. The altitude of this Lake is equal to the general plateau (4000 feet), even more than the average height of all the plateau land we traversed. In reverting to the question asked, why I consider the Lake Nyanza to be the great reservoir to the Nile, my answer is this: I find, by observation, that its southern extremity lies in east longitude 33°, and south latitude 2° 30′. By Arab information, in which I place implicit confidence, I have heard that the waters extend thence, in a northerly direction, certainly from five to six degrees. Notwithstanding they can account for a continuous line of water to this extent, no one ever heard of any limit or boundary to the northern end of the Lake. A respectable Sowahili merchant assured me that, when engaged in traffic some years previously to the northward of the Line and the westward of this lake, he had heard it commonly reported that large vessels frequented the northern extremity of these waters, in which the officers engaged in navigating them used sextants and kept a log, precisely similar to what is found in vessels on the Ocean. Query, Could this be in allusion to the expedition sent by Mahamad Ali up the Nile in former years? Concerning the rains which flood the Nile, the argument is simple, as I have said before: a group of mountains overhang the northern bed of the Tanganyika Lake. The Arabs assure us that from the north and north-eastern slopes of these hills during the rainy season immense volumes of water pour down in a north-easterly direction, traversing a flat marshy land, intersected by some very large, and many (they say 180) smaller streams. Again, on the western side, we hear from Dr. Krapf, that the snow-clad mountain, Kenia, is drained by rivers on its western slopes in a direction tending to my Lake.

During the rainy season, which I know, by inspection, commences in that region on the 15th of November, and ends on the 15th of May, the down-pour is pretty continuous. Super-saturation, I should imagine, takes place later on the northern than on the southern side of the aforesaid moon-shaped mountain, systematically in accordance to the ratio of seasonal progression; but this, in so mean a distance, could not be very great. Suffice it to say, that I saw the Malagarazi river, which emanates from near the axis of these hills, to be in a highly flooded state on the 5th of June. The Nile at Cairo regularly swells on the 18th of June.

Farther, it would be highly erroneous to suppose that the Nile could have any great fluctuations from any other source than periodical rains. Were the Nile supplied by snow, as some theorists suppose, its perennial volume would ever be the same. There would be no material fluctuations observable in it, in consequence of its constant and near approximation to the path of the sun.

By these discoveries, the old and erroneous hypothesis of a high latitudinal range of mountains extending across the continent of Africa from east to west, in the vicinity of the Line, and known as the Mountains of the Moon, is therefore now annihilated. However, it is worthy of remark, that the crescent-shaped mountain, which we visited to the northward of the Tanganyika, lies in the centre of the continent of Africa, immediately due west of the snowy peaks Kilimanjaro and Kenia, and is west beyond the Unyamuezi, or Country of the Moon. The Wanyamuezi tribe has from time immemorial been addicted to journeying, and at all periods has constantly visited the eastern coast of Africa. It would not be beyond legitimate and logical supposition, to imagine that these hills, lying beyond their Moon Country, should have given rise to the term Mountains of the Moon, and from misunderstanding their relative position with the snowy Kenia and Kilimanjaro, should have been the means of misguiding all ancient inquirers about that mysterious mountain.

My positions were fixed by astronomical observations, certainly under painful and considerable difficulties, owing to my constantly impaired general state of health: weakness and blindness not being the least of these difficulties which I had to contend with. My latitudes were taken by the altitude of stars, at nearly every stage, on an average from ten to fifteen miles apart. I also fixed some crucial stations, the principal points for delineating the country by lunars, on which I place great reliance, as the means of the masses of them which I took show so little deviation. The intermediate distances I compassed very closely; the altitudes of the country I traversed I determined by boiling thermometer; on which I also place very great reliance. We had a thermometer and pedometer, and several chronometers. The performance of these instruments was anything but satisfactory: indeed, finally, I had to rig up a string and bullet pendulum to beat time whilst taking my lunars in the latter stage of the journey. There now can be no doubt that this great lake, the Nyanza (Captain Speke now pointing to the map), is the great reservoir of the Nile, and that its waters indubitably extend northwards from the position visited by me on its southern extremity to 3½° north-latitude, lying across the equator, and washes out that supposed line of mountains, called the Mountains of the Moon, which stands so conspicuously in all our atlases.

The PRESIDENT (to Mr. Macqueen).—In short he carries his lake through your mountains.

DR. BIGSBY, F.R.G.S., desired some farther information concerning the people, their civility, numbers, and mode of subsistence.

The PRESIDENT thought such matter foreign to the subject of the paper.

MR. MACQUEEN, F.R.G.S., said the question of the sources of the Nile had cost him much trouble and research, and he was sure there was no material error either in longitude or latitude in the position he had ascribed to them, namely, a little to the eastward of the meridian of 35°, and a little northward of the equator. That was the principal source of the White Nile. The mountains there were exceedingly high, from the equator north to Kaffa Cnarea. All the authorities, from east, west, north, or south, now perfectly competent to form judgments upon such a matter, agreed with him; and among them were the officers commanding the Egyptian commission. It was impossible they could all be mistaken. Dr. Krapf had been within a very short distance of it; he was more than 180 miles from Mombas, and he saw snow upon the mountains. He conversed with the people who came from them, and who told him of the snow and exceeding coldness of the temperature. The line of perpetual congelation, it was well known, was 17,000 feet above the sea. He had an account of the navigation of the White Nile by the Egyptian expedition. It was then given as 3° 30′ N. lat. and 31° S. lat. At this point the expedition turned back for want of a sufficient depth of water. Here the river was 1370 feet broad, and the velocity of the current *one-quarter* of a mile per hour. The journals also gave a specific and daily current, the depth and width of the river, and everything, indeed, connected with it. Surely, looking at the current of the river, the height of the Cartoom above the level of the sea, and the distance thence up to the equator, the sources of the Nile must be 6000 or 8000 feet above the level of the sea, and still much below the line of the snow, which was 6000 or 8000 feet farther above them. He deeply regretted he was unable to complete the diagram for the rest of the papers he had given to the Society, for it was more important than any others he had previously given. It contained the Journey over Africa from sea to sea, second only to that of Dr. Livingstone. But all the rivers coming down from the mountains in question, and running south eastward, had been clearly stated by Dr. Krapf, who gave every particular concerning them. He should like to know what the natives had said was to the northward of the large lake; did they say the rivers ran out from or into the lake? How could the Egyptian officers be mistaken?

CAPTAIN SPEKE replied. They were not mistaken; and if they had pursued their journey 50 miles farther, they would undoubtedly have found themselves at the northern borders of this lake.

MR. MACQUEEN said that other travellers, Don Angelo for instance, had been within one and a half degree of the Equator, and saw the mountain of Kimborat under the Line, and persisted in the statement, adding, that travellers had been up the river until they found it a mere brook. He felt convinced that the large lake alluded to by Captain Speke was not the source of the Nile: it was impossible it could be so, for it was not at a sufficiently high altitude.

The paper presented to the Society, when fully read in conjunction with the map, will clearly show that the Bahr-el-Abiad has no connection with Kilimanjaro, that it has no connection whatever with any lake or river to the south of the Equator, and that the swelling of the river Nile proceeds from the tropical rains of the northern torrid zone, as was stated emphatically to Julius Cæsar by the chief Egyptian priest Acoreus 2000 years ago.

In nearly 3° N. lat. there is a great cataract, which boats cannot pass. It is called Gherba. About half-way (50 miles) above, and between this cataract and Robego, the capital of Kuenda, the river becomes so narrow as to be crossed by a bridge formed by a tree thrown across it. Above Gherba no stream joins the river either from the south or south-west.

COLONEL SYKES, F.R.G.S., thought the difficulties raised by Mr. Macqueen quite reconcileable with the facts stated by Captain Speke, as resulting from his and Captain Burton's explorations, for every great river had more than one source. He illustrated his observation by a practical reference to the human hand and arm; supposing the latter to be the main stream, the fingers might form the sources, all converging at the wrist to one great whole. The only question, therefore, was, which of those branches should be considered the chief source of the river? But each might be equal in size and of equal distance from the point of junction. The fact was, they were all sources. Captain Speke described a range of mountains running, not from east to west, but from north to south across the Equator. This range had necessarily a double watershed to the east and to the west. The rivers observed by Krapf and Rebmann ran down to the eastward, but other rivers (describing them on the map) ran down to the westward. Consequently there were two directions in which the waters run from exactly the same locality. What, therefore, could be more reasonable than to suppose that the water parting to the westward should run into the lake mentioned by Captain Speke? And as this lake was at an elevation of 4000 feet above the sea, and the depression of the country was from the lake towards the north generally, as indicated by the course of the Nile, which had been traced up to within 3½° of the Equator, it is more than probable that the lake was one of the chief sources of the Nile, and that other neighbouring sources would be found in the snow-peaks of Kilimanjaro and Kænia, forming parts of the range of mountains spoken of by Captain Speke. Mr. Macqueen spoke of the improbability of there being snow-capped mountains upon the Equator, as their elevation must necessarily be above 17,000 feet; but we are not justified in impugning the accuracy of the statements of Krapf and Rebmann. Under religious impulses, their vocation as missionaries was the promulgation of truth, and we cannot suppose them capable of inventions for which there was not any motive.

The origin of Pliny's associating the source of the Nile with the Mountains of the Moon, would seem to find an explanation in the name of the nation or tribe living in the neighbourhood of the lake being the same with that of the moon: mistakes in modern times are traceable to associations much weaker than this.

But a full discussion of Captains Burton and Speke's labours must be reserved for a future occasion; meanwhile we are satisfied that important geographical discoveries have been made.

Mr. Macqueen said that if the Nile or its sources were to the south of the Equator, it would not fall where the Egyptian expedition had left it, viz. at 3° 30′ north on the 26th of January, but it then fell so fast that the expedition did not proceed. As a proof that the Nile did not rise to the south of the Equator, it was only necessary to mention the fact that the rains on the south of the Line commenced in December and in January and February, and became very strong; the river would be flooded, therefore, in January, in place of falling: this he thought settled the point beyond question. He admitted the Nile must have more sources than one, but not one of them went so far south; if it did, the principal branch would have certainly been flooded in January, whereas in that month it fell: but at the end of March, exactly as the sun came back towards the Equator and the rains fell to the north, it would rise again.

Colonel Sykes observed that tropical rains north of the Equator commenced in June.

Mr. Macqueen said he had been speaking of the south.

Captain Speke obtained his information of the countries tending northwards, along the western borders of the Lake, from highly intelligent Arab merchants, from whom he had previously received some excellent and trustworthy information, and he felt he might rely on what they had stated, in regard to the ground under dispute, more especially as it corroborated his own observations made on the Malagarazi River.

PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

SESSION 1858–9.

Twelfth Meeting (ANNIVERSARY), 1 P.M., *May 23rd*, 1859.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

THE Minutes of the previous Meeting having been confirmed, the regulations respecting the Anniversary Meetings were next read, when the President appointed A. G. Findlay and John Lyons M'Leod, Esqrs., Scrutineers for the Ballot.

Lieut.-General Peter de la Motte, C.B.: Capt. Richard F. Burton; Capt. William F. Tytler; and Stephen W. Silver; Frederick B. Montgomerie; Coleridge Kennard; Walter F. Leslie, of New South Wales; Edward W. Stafford, Colonial Secretary of New Zealand; and Christian Hellmann, Esqrs., were proposed as Candidates for election at the next Meeting.

The Report of the Council, with the Balance Sheet for 1858 and the Estimate for 1859, was then read and adopted.

The President next delivered the Founder's Gold Medal to Capt. Richard F. Burton, for his various exploratory enterprises, and especially for his perilous expedition, in company with Capt. J. H. Speke, to the great Lakes in Eastern Central Africa.

The Patron's or Victoria Gold Medal was delivered to the Earl of Carnarvon, on behalf of Captain John Palliser, for the valuable results of his explorations in British North America and the Rocky Mountains.

A Gold Watch, awarded to Mr. J. Macdougall Stuart, for his discoveries in South and Central Australia, was delivered to Count P. E. de Strzelecki for transmission to him.

The President then read his Anniversary Address, for which a unanimous Vote of Thanks was passed, with a request that he would allow it to be printed.

At the conclusion of the Ballot, the Scrutineers reported that the changes advised by the Council had been adopted; Sir Roderick I. Murchison, the President, retiring at the expiration of his second year of office, to be succeeded by the Earl of Ripon; the vacancy among the Vice-Presidents, occasioned by the retirement of Rear-Admiral Sir George Back, to be supplied by Sir Roderick I. Murchison; and those among the Ordinary Councillors, caused by the retirement of Lord Broughton, Lord Dufferin, Lieut.-General C. R. Fox, Colonel J. H. Lefroy, R.A., the Bishop of Oxford, Sir Henry Rawlinson, and Colonel T. M. Steele, to be filled by Sir Benjamin Brodie, Bart., the Hon. F. H. G. Calthorpe, M.P., Captain the Hon. J. Denman, R.N., Laurence Oliphant, Esq., Major-General J. E. Portlock, R.E., and J. A. Warre, Esq., M.P.

Thanks having been voted to the President, Vice-Presidents, Members of the Council, Auditors, and Scrutineers, the President finally directed attention to the usual Anniversary Dinner, and the Meeting adjourned.

PRESENTATION

OF THE

ROYAL AWARDS

To Captain R. F. BURTON and Captain JOHN PALLISER.

THE President read the following statements explanatory of the grounds on which the Council had awarded the Royal Medals respectively:—

The Founder's Medal of the Royal Geographical Society has been adjudicated to Captain R. F. Burton, of the Bombay Army, who has explored a vast region of Eastern and Central Africa never before traversed by any geographer; and for the discovery of the great internal lake of Tanganyika—the more northern lake of Nyanza being discovered by his coadjutor, Captain Speke.

Captain Burton is well known for his most interesting journey, under the auspices of this Society, as an Afghan pilgrim, to the Holy places in Arabia in the autumn of 1853, as recorded in our Journal, vols. XXIV. and XXV., and in the popular account of it published by himself. These volumes showed Captain Burton to be an accomplished Orientalist, and admirably fitted for a traveller among the difficulties of Eastern countries.

In the ensuing year he volunteered to explore Eastern Africa from Berbera to Zanzibar, accompanied by Lieutenant Stroyan and Lieutenant Speke, the latter of whom had been for several years collecting the fauna of Little Tibet and the Himálaya Mountains. In a preliminary journey, Captain Burton, alone, succeeded in reaching and describing Harar, never before visited by Europeans. Lieutenant Speke, on his part, also alone, explored the interior of the Somali country, made extensive collections and many observations, and produced a map of those tracts. The farther prosecution of that expedition, when these officers were united with Stroyan and Herne, was frustrated by an attack of the Somalis, in which Lieutenant Stroyan was killed, and Lieutenants Burton and Speke were both severely wounded. These occurrences are recorded in our Journal, vol. xxv., and also in the work 'First Footsteps in Eastern Africa.'

In 1856 Captain Burton proceeded with Captain Speke, under the auspices of our Society, and assisted by the Foreign Office and the Hon. East India Company, to Zanzibar; and in January, 1857, made a tentative journey to Fuga, the account of which, by Captain Burton, with a map constructed from Captain Speke's field-book, is given in our Proceedings, and will appear in a more extended form in the next volume of the Journal.

On June 26th, 1857, Captains Burton and Speke started from Zanzibar for the interior, and succeeded in reaching the great Lake Tanganyika, 300 miles long and 30 broad, and about 700 miles from the coast; having travelled, at a rough estimate, from 1200 to 1500 miles. Their very careful and complete itineraries, maps and field-books, have been received; Captain Speke having made astronomical observations which determine the latitude and longitude of the places they visited. These results, as well as the determination of the principal altitudes, were obtained in spite of severe hardships, privations, and illnesses.

A marked feature of the expedition is the journey of Captain Speke from Unyanyembé to the vast inland fresh-water lake called Nyanza, the south end of which was fixed by him at 2° 30′ S. lat. and 33° 30′ E. long., which, being estimated to have a width of about 90 miles, is said to extend northwards for upwards of 300 miles.

For the very important results of the expedition—of which Captain Burton was the leader—as well as for his former bold and adventurous researches, the Council have considered him to be highly entitled to the honour conferred on him.

The President then addressed Captain Burton in these words:—

"Captain Burton,—I have now to request you to accept this Medal, with the assurance that, as the geographers of England have watched your various and most adventurous explorations with the deepest interest, so I rejoice that the Council of this Society has had it in their power thus to recompense your highly distinguished services.

"I must also take this opportunity of expressing to you my hearty approbation of the very important part which your colleague, Captain Speke, has played in the course of the African expedition headed by yourself. In the Address to the Society, which is to follow, when I further advert to your meritorious services, I shall dwell upon the discovery of the vast interior Lake of Nyanza, made by your associate when you were prostrated by illness,—a discovery which in itself is also, in my opinion, well worthy of the highest honour this Society can bestow."

Captain Burton replied:—

"Mr. President,—I thank you, Sir, most sincerely for this honour, and for the kind and flattering expressions by which you have enhanced its value. Allow me, at the same time, to embrace the opportunity of expressing my gratitude to this powerful and influential Society for the favours of past years. When comparatively unknown I was enabled, by the generous support of the Royal Geographical Society, to enter upon the field of Arabian exploration. At a subsequent period their interest forwarded me into the Somali country; and, on the present occasion, to them—and to them only—do I ascribe the success which has attended my last expedition. This valuable gift will remain with me a lasting memorial of my debt of gratitude.

"You have alluded, Sir, to the success of the last expedition. Justice compels me to state the circumstances under which it attained that success. To Captain J. H. Speke are due those geographical results to which you have alluded in such flattering terms. Whilst I undertook the history and ethnography, the languages and the peculiarities of the people, to Captain Speke fell the arduous task of delineating an exact topography, and of laying down our positions by astronomical observations—a labour to which at times even the undaunted Livingstone found himself unequal. I conclude with the warmest wishes for the prosperity of the Royal Geographical Society, and with expressing my desire that we may have a further opportunity of prosecuting our labours in this good cause."

The Patron's or Victoria Gold Medal has been awarded to Captain John Palliser, for the successful results of the exploration of large tracts in British North America by the expedition under his command during the years 1857–8; and more particularly for the determination of the existence of practicable passes across the Rocky Mountains within the British territories.

This expedition—as is well known—originated in the pressing recommendation of the Royal Geographical Society; and the officers appointed by Her Majesty's Government to serve under Captain Palliser were, Dr. Hector, naturalist and geologist; Lieutenant Blakiston, magnetician; Mr. Sullivan, secretary; and M. Bourgeau, botanist.

One of the chief geographical features of the first year's survey was the discovery of a low waterparting, hitherto unknown to us, near the "Qui Appelle Lakes," where the water flows eastwards into the Assiniboine River, and westwards into the Saskatchewan.

A long and rapid winter journey, with sledges and dogs, from Fort Carlton, by Forts Pitt and Edmonton, to Mountain House, on the eastern flank of the Rocky Mountains, was accomplished by Dr. Hector to procure men and horses, and during which he obtained valuable preliminary information. Numerous astronomical and physical observations were made by Dr. Hector and Mr. Sullivan at Fort Carlton; the former of these sending home a clear sketch of the geological structure of the vast region of the Prairie country, with its horizontal strata of cretaceous and tertiary formations, as contrasted with the rocky eastern country traversed by the canoe route between Lakes Superior and Winnipeg. In the same period, Lieutenant (now Captain) Blakiston made, as we are informed by General Sabine, many important observations in Terrestrial Magnetism.

In the last summer—leaving Fort Carlton, and approaching the Rocky Mountains midway between the north and south branches of the Saskatchewan—Captain Palliser divided his force into three parties. Accompanied by Mr. Sullivan, he traversed the Rocky Mountains himself by the Kananaski Pass to the south of Old Bow Fort, the summit level of the route being fixed at 5985 feet above the sea. Reaching the drainage of the Pacific, he descended the Kutanie River till he met with north-flowing lakes, which are the real sources of the great Columbia; and thence, following the Kutanie River southward along the Tobacco Plains to near the American boundary, he recrossed the chain by the Kutanie Pass, nearly 6000 feet above the sea, in lat. 49° 30′. Captain Blakiston, also (as since reported), traversed and levelled this pass, which is in British territory, and returned to the plains of the Saskatchewan by the Boundary Pass, the greater part of which is in American territory.

Whilst M. Bourgeau remained to collect plants in a favourable spot amid the Rocky Mountains, in lat. 51°, Dr. Hector traversed the chain by the Vermilion Pass, in 51° 10′, emerging into the Pacific drainage on the banks of the Kutanie River. The height of this pass was determined to be 4944 feet, and it is therefore much lower than the other passes, which were examined. Threading his way to the north around two lofty mountains, which he named Mount Goodsir and Mount Vaux, he travelled over high land to the N.N.W. until he passed round the flanks of the highest mountain in this part of the range, 15,789 feet high, in lat. 52°, which he named Mount Murchison; and then following the north

Saskatchewan from its glacial sources, he descended to Mountain House on the east, and regained Fort Edmonton, charged with numerous geological as well as astronomical and physical observations.

For the vigorous execution of his duties, the judicious distribution of the parties under his command, and particularly for having successfully carried out the wishes of the Royal Geographical Society and the instructions of Her Majesty's Government, in determining the existence of several practicable passes across the Rocky Mountains of British North America (hitherto not laid down on any published map), between the American boundary, or 49°, and 52° N. lat., the Council have awarded the Patron's Medal to Captain John Palliser.

The President then addressed the Earl of Carnarvon in these words:—

> "Lord Carnarvon,—It gives me great satisfaction to place in your hands, as the representative of the Secretary for the Colonies, this the Patron's or Victoria Medal of the Royal Geographical Society.
>
> "Knowing as I do that the deepest interest in the Palliser Expedition has been felt by the Secretaries for the Colonies of the last and present Administration, I also know that neither Mr. Labouchere, under whose auspices these researches were organised, nor Sir Edward B. Lytton, who has vigorously supported them, can attach more importance to their issue than your Lordship does in coming here to receive this Medal.
>
> "Pray, therefore, preserve it until Captain Palliser, after traversing the Rocky Mountains and British Columbia, shall arrive in England; and then beg him to consider it as the best reward the geographers can offer to him, in honour of the important services performed by the expedition under his command."

The Earl of Carnarvon replied:—

> "Sir,—In accepting, on behalf of Captain Palliser, the Medal which, by the award of the Geographical Society and yourself, has been assigned to him for the conduct of the expedition in British North America, I greatly regret the absence of Sir Edward Lytton, who has from the first taken a deep interest in the success of the expedition, and to whom the task which I have now undertaken more properly belongs. At the same time I may, from the information to which I have had access at the Colonial Office, safely endorse the praise which you have given to Captain Palliser for the skill and perseverance, the practical energy and discrimination which he has evinced—essential qualities in any officer situated as he has been.
>
> "The expedition which he has conducted has already achieved

considerable results. Whilst the tide of emigration in the United States rolls westward some 200 or 300 miles every year, we have not been altogether idle north of the 49th parallel. It may now almost be said that three links have been forged in the great chain of regular communication from the Atlantic to the Pacific, stretching across some 3000 miles of continent.

"Within the last two years an expedition has been sent out by the Canadian Government to explore the country which lies between Lake Superior and the Red River settlement. The reports of the expedition are in print, are accessible to every one, and deserve an attentive consideration.

"From the Red River settlement to the base of the Rocky Mountains Captain Palliser has conducted his inquiries; and in the wonderful rise of the new colony of British Columbia, may be traced the completion, in outline at least, of the long line of communication.

"It is not now unreasonable to look forward to the establishment of a regular system of transit, commencing from Nova Scotia and the shores of New Brunswick, passing through Canada, touching upon the Red River settlement, crossing the prairies of the Saskatchewan, passing through the Vermilion Pass, where we know that the inclination is so moderate that nature has placed no insurmountable obstacles to the construction of a railway, till it reaches the gold-bearing colony of British Columbia, creating fresh centres of civilisation, and consolidating British interests and feelings.

"It only remains for me to undertake that the Medal which you have placed in my hands shall be duly conveyed to Captain Palliser; and I feel sure that this tribute of praise on the part of the Geographical Society will be held by him as the most valuable memorial of his long, arduous, and successful expedition."

A Gold Watch having been adjudicated by the Council to Mr. John Macdougall Stuart "for his remarkable exploration in South Australia, undertaken at his own expense, and which led to the signal discovery of 18,000 square miles of valuable and well-watered pastoral country, far to the north of the western saline region of that colony"—

The President, in delivering the watch to Count Strzelecki, thus spoke:—

"To you, Count Strzelecki, who, at your own expense, and animated solely by the love of discovery, explored many years ago the water-parting of Eastern Australia, I confide this watch. In requesting you to have it conveyed to Mr. Macdougall Stuart (who was well trained in Australian adventure by our medallist Sturt), I beg you to assure him, that I have read the modest account of his great success with true gratification, and have rejoiced in the hearty commendation bestowed upon his conduct by the Governor of South Australia, Sir R. G. Macdonnell. The bold explorer will, I have no doubt, consider this memento of our esteem to be much enhanced by receiving it through the hands of so distinguished an Australian traveller as yourself."

Count Strzelecki replied:—

"Sir Roderick,—I am deeply indebted to you, not only for the flattering choice which you have made of me as the medium of transmitting this award of the Council to Mr. Macdougall Stuart, but also for the kind and courteous manner in which you have commented upon the services rendered to geography by my fellow Australian explorer.

"I need not assure you, Sir, that this mark of the approbation of the Royal Geographical Society, whilst it stamps the value of the journeys and important discoveries of Mr. Stuart, will be to him both a proud memorial of those services, and a fresh stimulus to his further exertions in the cause of geography."

ADDRESS

TO THE

ROYAL GEOGRAPHICAL SOCIETY OF LONDON;

Delivered at the Anniversary Meeting on the 23rd May, 1859,

By Sir Roderick Impey Murchison,
G.C.St.S., D.C.L., M.A., F.R.S., &c.,
PRESIDENT.

In mourning for the loss of the most illustrious geographer and traveller of our age, I naturally open the Address to this Society by laying before you a brief sketch of the career of Baron Alexander von Humboldt, and by an effort, inadequate as it must be, to pay a due tribute to the memory of him who, in the course of a long, well-spent, and glorious life, has justly obtained the admiration of mankind.

William and Alexander von Humboldt, the sons of a Major in the Prussian service, were two as remarkable men as the last century has produced; the one a profound scholar and celebrated statesman, the other our deceased associate.

Alexander, or, rather, Frederick Henry Alexander von Humboldt was born in the year 1769, so famous for the births of Napoleon, Walter Scott, and Wellington. He owed his early sound education to his mother, a relative of Princess Blucher. Being of a weakly constitution when young, it appears, to use his own words, that, with an improvement in his health, his mind was suddenly illuminated, and that he was roused to endeavour to keep pace with his brother William, who was two years older than himself. The youths were first instructed at Berlin, in philosophy, law, and statesmanship, by Engel, Klein, and Wohn; and the eminent Willdenow, observing the love of the study of nature in Alexander, initiated him in botany. Thus prepared, the two brothers entered the University of Frankfort on the Oder, and subsequently that of Göttingen, where they were taught by Heyne and Eichhorn, and where Alexander specially profited by the lectures of that great zoologist, the striking and original Blumenbach. He next repaired to the Mining School of Freiberg, in 1791, to complete that education which should qualify him for examining the earth, its constituent parts and superficial products. There he met with Leopold von Buch, also a disciple of Werner, the great geologist of the day, who, by his eloquent lectures, had given an European character to that small but justly celebrated mining school.

The friendship then formed between Humboldt and Von Buch was kept up through life; and it is highly to the credit of Werner and his little mining school of Saxony, that he should have launched two such men,—the one to become the greatest geologist which Germany has produced, the other the most universal geographer, traveller, and natural philosopher of this century. In their observations of nature, they both, however, soon emancipated themselves from some of the untenable dogmas of their master. Honoured as I have been in my humble career by the encouragement of both these great men, I may be permitted to state that, as Von Buch was the senior scholar at the Mining Academy of Freiberg, so he seemed to preserve through life a commanding influence over his illustrious friend on all those subjects connected with the structure of the earth in which I have been most occupied. No two men could be more dissimilar in character. Possessing a warm temperament and a somewhat abrupt address, Leopold von Buch contrasted strongly with the bland and captivating Humboldt; yet each of these Freiberg scholars secured the sincere affection as well as admiration of their contemporaries in their respective careers through life.

Whilst he held official appointments in the department of mines of Prussia, and at Bayreuth and Anspach, Humboldt prepared his works on the Fossil Flora, viz., the 'Flora Subterranea Freibergensis et Aphorismi ex Physiologia Chemica Plantarum,' and the 'Floræ Freibergensis Prodromus.' Even as early as 1797 he showed the great versatility of his powers by another work, on a very different subject, 'The Nervous and Muscular Irritation of Animal Fibre,' due to his intercourse with Galvani.

After the death of his accomplished mother, Humboldt began to arrange the scheme of his future travels. His strong desire to undertake these travels was, as he himself assures us, raised into a passion by Forster, one of the companions of Cook in his voyage round the world, and whose acquaintance the young Prussian scholar had made at Göttingen, and with whom he made geological excursions both in England and on the Rhine. And here I may state that it is the opinion of the eminent geographer, Carl Ritter, as expressed to me in a letter just received, that the whole of the future life of Humboldt was powerfully influenced by the voyager Forster, whose well-told tales of adventure first excited in his breast that ardour for travel and research in the domains of nature which characterised him ever after.

Studying meteorology in Paris, and collecting materials for the purpose of explorations, he formed the acquaintance of his future companion Aimé Bonpland, with whom he was to have proceeded in the expedition of Baudin, destined to survey South America. But, impatient of the delays attendant on that French expedition, he went to Madrid with his young botanical friend, to obtain the royal Spanish authority for their exploration of South America. After a short excursion to Egypt, they sailed in the Spanish frigate *Pizarro*, which fortunately reached Cumana in July, 1791; having visited Teneriffe and examined its wonders by the way, and having almost miraculously escaped the British cruisers.

I will not occupy your time by alluding to all the tracts in South and Central America successively visited and explored by Humboldt. Suffice it to say that, during four years of indefatigable surveys and researches, including his daring voyages up the great rivers Orinoco, Negro, and Amazon, he enriched science by his numerous astronomical determinations, and observations on the meteorological, botanical, zoological, mineralogical, geological, and ethnological phenomena. The exploration of the course of the Amazon was followed by his ascent of Chimborazo, where, at the height of 19,300 feet, he and Bonpland made observations, notwithstanding their great sufferings, caused by the rarefaction of the atmosphere and the intensity of the cold. From Quito and Peru he repaired to Mexico, making by the way observations on the narrowest portion of the isthmus which connects Central with South America, which led him to entertain those ideas on the practicability of an Inter-Oceanic Ship Canal in that parallel, to which the attention of this Society has been called on a former occasion.

Returning to France from the United States in 1804, Paris was his chief home from that year to 1827. Arranging there his splendid collections, and surrounded and honoured by all the leading members of the Academy of Sciences, he published successively that series of volumes which, showing his mastery over all the kingdoms of nature, have rendered his name famous for all ages. Although in these efforts he was assisted by Arago, Gay Lussac, Cuvier, Klaproth, Valenciennes, and Latreille, his grand generalizations have drawn from his contemporaries the admission, that since Aristotle, Humboldt is almost the only example of such achievements.

In 1829, on the invitation of the Emperor Nicholas, who defrayed the expenses of the journey, Humboldt, being then in his sixtieth year, undertook his memorable expedition into Siberia, accompanied by the eminent mineralogist Gustav Rosé and the profound microscopist Ehrenberg. This journey, hurried as it was—for he travelled 11,500 miles—was not only fertile in those results which are recorded in his 'Asie Centrale,' and in the excellent mineralogical work of his companion Rosé, but was also productive of many important data relating to terrestrial magnetism.

We know, indeed, that his Siberian travels gave rise to that influence, which was constantly exerted by him in succeeding years in urging the various European Governments to establish magnetic observations in distant lands, and particularly over wide regions in Russia, America, and England. When the British Association inaugurated the formation of the Physical Observatory at Kew, which has put forth such good fruits, we well know the strength we obtained when we appealed to him; for then it was that he vigorously maintained the necessity of rendering physical observatories independent of astronomical observatories. We also know how such physical observatories, both here and abroad, have enabled our associate Sabine to investigate the laws of the magnetical phenomena.

It is unnecessary that I should here mention all the publications of Humboldt which have been prized by our generation. It is enough to say that the same marvellous man, who made such gigantic journeys in distant lands, and published splendid works in illustration of them, has also produced, both in the French and German languages, a variety of works on astronomy, on geology ('Classification des Roches'), on the geographical distribution of plants, on the distribution of heat in the globe, on electrical fishes, and even on the political condition of Cuba.

His great work, 'Kosmos,' which it had been the main object of his life to produce, shows what a profusion of clear recollections of natural phenomena was stored up in his capacious mind, and with what eloquence he could put forth that extraordinary knowledge. To the first part of the last volume I specially called your attention at the preceding Anniversary, as in it the author had descended from the heavens and atmosphere as treated of in his earlier volumes, and dealt more specially with that planet to which my own occupations have been restricted.

We have yet to receive the final instalment of the veteran philosopher, and doubtless the very last words he wrote will be treasured up and given to the world exactly as he left them. And if the pen fell from his hand, leaving that last sentence unfinished, let no one endeavour to complete it; for the true peroration of this great work will be found in the eulogiums which will everywhere be recited in honour of its author.

As one of the first acts of the Council of this Society was to place Humboldt at the head of our Honorary members, so he lost no opportunity of testifying the deep interest which he took in our welfare, often speaking of our volumes in terms of strong approbation. Always regretting that his travels had not extended to Hindostan and the Himályan Mountains on the one hand, and to Africa on the other, he ever strove to promote researches in both these regions.

In his 'Asie Centrale' we perceive how sedulously he had studied the works of every geographer and traveller which had shed light upon the configuration, direction, and altitude of the great chains which traverse Asia; the labours of all our English authors and explorers of the great Himálya range being thoroughly well known to him. Panting to obtain an insight into the regions lying to the north of that chain, it was through his stimulus that the expedition of the brothers Schlagintweit was organized, and through his influence that these young men, whose scientific acquirements he highly valued, were sent to push their researches farther to the north than previous explorers. The delight which he took in their progress was seen in the warm and affectionate commendation he bestowed on them for traversing the Kuen Lun and reaching the Trans-Himályan region of Yarkand. I can also well imagine the profound sorrow he must have felt when Adolphe Schlagintweit, the one of these three brothers who has fallen a victim to his zeal, was assassinated before the walls of Kashgar; all his valuable observations and papers being lost with the death of the courageous traveller.

Keenly intent upon every exploration of the interior of Africa, Humboldt was naturally proud that his countrymen Overweg and Barth should successively have distinguished themselves in the British expedition which commenced under the guidance of Richardson, and it was mainly through his exertions that the accomplished young astronomer Vogel was added to the list of those who were endeavouring to define the geography and condition of inner Africa.

That Humboldt lived unto his ninetieth year is chronicled; but knowing well his habits, I may be permitted to say that in reality he lived upwards of a century: for, whilst the average daily amount of sleep of man is seven or eight hours, the rest he took from his earliest youth never exceeded four hours; all his waking moments being so vigorously and profitably employed as virtually to constitute a century of highly-strung mental existence.

Though he was a good listener, and a clear questioner whenever he sought to obtain knowledge from others (which, by the bye, he never forgot), it may be also said of him that in his long career he talked more than any one of his contemporaries with whom I have been acquainted. His correspondence was particularly extensive, and the piles of letters which he had to answer almost overpowered him. And yet a few months before his death he not only took the trouble of replying to many of his old scientific correspondents, but I have before me the copy of a long and kind letter which he wrote last year to our worthy associate Mr. John Brown, with whom he was personally unacquainted, thanking him for the present of his volume on 'Arctic Discoveries.'

Nor is it to be forgotten that he took particular delight in conversing with women, and that he was a great favourite with them; his soft voice and persuasive diction, in which he conveyed instruction without hard words or ostentation, being peculiarly grateful to the gentler sex, to say nothing of that *piquant* and good-humoured irony in which he frequently indulged.

But it was not merely by his kind courtesy and correspondence that Humboldt won the affectionate attachment of mankind. He was invariably the ardent and disinterested promoter of merit and desert, under whatever form they were presented to him. Every young man struggling with difficulties, who had shown signs of energy in the cause of science, was sure to find in him a zealous and generous protector.[*] Thus, as it was the constant practice of his life to spare no trouble in sustaining those who had need of support, his loss will be deeply felt by men of science, art, and letters, not only in Germany, but throughout the civilized world.

During the career of the illustrious traveller, we know that he paid many visits to England, one of the first of which was in 1799, when he became acquainted with Robert Brown, and to this event I shall allude in speaking of that great botanist, for whom he had the sincerest regard. It was, indeed, one of his many good acts, that he induced the King of Prussia to bestow on that Robert Brown, so little known to public men in England, the high honour of the Order of Merit.

When in England in 1826, though then only fifty-seven, he had been before the world as a celebrated author during so many years that he was already looked upon as becoming old. But from that date he was destined to play for thirty-three years a new and, in many respects, a more important part. In 1827 he took up his residence in Berlin, and soon became a favourite of Frederick William III., and afterwards of the present Sovereign of Prussia. There are those, I know, who have regretted that the philosopher was thus converted into the courtier, but this opinion has no good foundation. In truth, he found in King Frederick William IV. a reciprocity of sentiment and a love of knowledge which might, with his influence, be turned to great advantage in the encouragement of all those who were busily engaged in the pursuit of scientific researches, and most efficaciously and warmly did Humboldt work on in this praiseworthy career. Impressed with the strong desire to aid every meritorious man of science, he was indeed fortunate in being the bosom friend of a warm-hearted Monarch, who invariably responded to his call. No one who has witnessed the free and unreserved converse between Humboldt and his Sovereign could fail to be convinced, that he never played the courtier's part but in the hearty desire of attaining some good and noble end. His liberal opinions were indeed so well known, that an occasional witty sarcasm on any monarchical abuse was tolerated in him as coming from one who, he himself said, was styled a French Jacobin.

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[*] Whilst these pages were passing through the press, I perused in the 'Boston Weekly Courier' of the 26th May the eulogy of Humboldt, read before the American Academy of Sciences by my eminent friend Agassiz, informing the public how, at a critical period in his youthful days, when from want of means he was about to leave Paris, the young naturalist was unexpectedly relieved by a liberal donative from the great traveller, sent to him in the most delicate manner, and was thus enabled to continue studies without which his career might have been nipped in the bud. After an eloquent analysis of the various works and generalizations of the deceased, and a warm encomium of his deep-searching volume, the 'Views of Nature,' Agassiz says with truth,—"Every child in our schools has his mind fed from the labours of Humboldt's brain wherever geography is no longer taught in the old routine."—*June* 15, 1859.

Visiting Prussia in 1840, eleven years after the Siberian journey of Humboldt, and repeating my visits in each following year whilst I was exploring a great part of the empire of Russia, I invariably received from him the most important suggestions, as well as the most marked attentions. The great traveller, having performed his long journey in an incredibly short time, was well aware that he had done little more than sketch out broad views of the geography, natural history, ethnography, and terrestrial magnetism of the vast regions over which he had passed, and consequently he much desired that other men should solve various problems which he had only time to touch. One of the largest of these problems that remained to be worked out was the geological structure of Russia; and when he saw the determination of my associate, De Verneuil, and myself to endeavour to elaborate the true geological succession of Russia in Europe and the Ural Mountains, he took especial pleasure in assisting us. In saying to me, "You will now be able to tell us the true age in the geological series of those sandstones which occupy so vast a region in the ancient kingdom of Permia," he gave me the first impulse to pursue researches in several of the distant provinces of Russia which ended in the establishment of the Permian group of rocks, as the youngest of the palæozoic formations, and in my attaching to it a name which has now become current in science.

Again, in his luminous conversation and writings on the great Aralo-Caspian depression of the earth's surface, he stimulated me to those endeavours which showed how in that vast low region, the physical geography of which he had described so well, the geologist could bring forth evidences of a transition from a lacustrine condition, through a brackish water period, into one of purely marine conditions.

With his views on the grandeur of the phenomena by which many ancient igneous rocks, differing from the eruptions of mere volcanos, have been extruded from fissures in the crust of the earth, and have been spread out over vast spaces, I agree, in common with his eminent friend M. Elie de Beaumont, as shown in my last Anniversary Address. Assuredly no man of his generation had seen more of volcanic rocks than Humboldt, and his judgment on this point must be viewed with profound respect.

During my last conversation with him at Potsdam, in September, 1857, I grieved to see that his physical powers had become much feebler in the lapse of a year, and that he was under the necessity of leaning on his servant as he walked. And when to my sorrow I also perceived that the health of the Sovereign of all others who so heartily cherished the cultivators of science and letters was failing, and that this change was making a deep impression on Humboldt, I feared that I might never more converse with the illustrious man. But whilst the frame was gradually bending and giving way, the bright intellect continued clear to the last; and one of his letters, which was written to me only a few weeks ago, exhibited the same suggestive mind and active interest in obtaining knowledge as in the best days of his bodily vigour.

One of these precious letters received last summer displays that love of youthful persons by which Humboldt was always characterized. The joy which the veteran philosopher experienced on possessing "cette patience de vivre" (as he termed his long life) which had enabled him to witness the happy union of the eldest daughter of our beloved Sovereign with the heir to the crown of Prussia, and to join in welcoming the accomplished Princess Royal to Prussia, is expressed in terms which showed how justly he estimated the influence which her graceful and captivating manners, and her good sense and right feeling, must produce upon the nation of her adoption. Even in the very last letter which I received from my illustrious friend, dated the 15th of last March, though it chiefly related to the means of facilitating the investigations of a Prussian traveller, from Tunis southwards, into the wilds of North Africa, there is a strong and warm expression of the gratification which he had felt in having lived to be present at the baptism of the first child of the Prince and Princess Frederick William, and of his conviction that his happiness was shared by all good Prussians.

This was, I apprehend, the last public ceremony at which Humboldt assisted. The lines with which he concludes his letter are penned with a tremulous hand, and in reply to my inquiry after his health he writes: "Mes forces musculaires reviennent très lente-"ment, et je souffre sous le poids d'une correspondance de 1800 "à 2000 lettres et paquets par an. Une sorte de célébrité qui "se répand avec l'âge, et s'augmente à mesure que l'on devient "imbécile."

Valuing the knowledge I obtained personally from him, and the hearty kindness and zeal with which he uniformly aided me, I would that it were in my power to render ampler justice to so great and so good a man. But many of the works of Humboldt, particularly his records of the physical phenomena of the universe, lie beyond the critical scope of a geologist like myself. These works will doubtless be crowned with appropriate laurels by those who can duly scan their lofty merits. My humble offering comes from one who, profoundly admiring the works of this great philosopher which lie in his own line of research, will ever be proud of the recollection that he was encouraged in his career by the truly illustrious Humboldt.*

All praise to the gallant and intellectual nation to which he belonged for the respect and love which they bore to him through life, and for the profound sorrow which they testified on his decease. Never probably was the body of any man followed to the grave with deeper and more touching respect, nor by a larger number of people of all classes, from the Regent and Prince Royal of Prussia and the other members of the Royal Family to the humblest citizen. And when the account of his last moments was conveyed to the Monarch whom he had so long and so faithfully served, I feel convinced that the oppression of mind caused by a severe malady would be dissipated, and that all the affectionate recollections of the benevolent Sovereign were revived, as he wailed over the death of his bosom friend.

When presiding over this Society in the year 1853, I opened my Address by lamenting the death of the great Prussian palæontologist and geographical geologist, Leopold von Buch, and said that "in losing him we were left almost alone with Humboldt as the last of that race of philosophical generalizers who are capable of placing before us in one work all the natural features and contents of a vast region."

It was on that occasion that the deepest feelings of Humboldt were poured forth in a letter in which he announced to me his irreparable loss. "Suis je destiné," he wrote, "moi vieillard de 83 ans, de vous annoncer, cher Chevalier, la plus affligeante des nouvelles, à vous pour lequel M. de Buch professait une si tendre amitié, à ce grand nombre d'admirateurs de son génie, de ses immenses travaux, de son noble caractère." Then, after describing the course of the malady which caused the death of the great geologist, and recapitulating their long and unvarying intimacy during 63 years, Humboldt adds:—

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* Among the numerous portraits of Humboldt, there is no one which comes so home to the geographer as that little sketch of the veteran who, seated in his cabinet, is surrounded by his books, packets of correspondence, and the map of the world which he had so illustrated. In the corner of this coloured lithograph is his own affirmation that this is "Ein treues Bild meines Arbeits Zimmers als ich den zweiten Theil der Kosmos schrieb." A very striking little photograph of him, the last likeness which was taken, has been sent me by the brothers Schlagintweit, who were with him just before his last illness, and to whom he granted this favour.

"Ce n'était pas seulement une des grandes illustrations de notre époque, c'était aussi une âme noble et belle! Il a laissé une trace lumineuse partout où il a passé. Lui pourroit se vanter d'avoir énormément étendu les limites de la science géologique, toujours en contact avec la Nature même. Ma douleur est profonde: sans lui je me crois bien isolé; je le consultai comme un maître, et son affection m'a soutenu dans mes travaux."

Expanding the term "geological science" into "all science," let these his own lines, penned in the moment of grief for the loss of his most valued friend, be applied by geographers to the memory of the great man himself, whom we all consulted as a master, and we then have in his own emphatic words the true characteristics of the universal Humboldt.

THE ARCHDUKE JOHN OF AUSTRIA.—The last surviving brother of the Emperor Francis, the beloved "Unser Franz" of every Austrian, has paid the debt of nature at the good old age of seventy-seven. One of nine brothers, most of whom were distinguished for their acquaintance with the sciences, and one of whom—the Archduke Charles—was the able opponent of Napoleon in the art of war, our deceased foreign member may, without any flattery, be singled out as a Prince who, loving geographical science, was at the same time an accomplished mineralogist and botanist, and who has passed a life so full of good deeds, that his memory will ever be cherished throughout Germany.

Brought up as a soldier to oppose the armies of revolutionary France, the Archduke was eminently successful when, leading the faithful Tyrolese, he commanded the army of Italy, which, in 1809, defeated the Viceroy Engène Beauharnais at Sacile, on the Licenza (N.N.E. of Venice), and forced him back to the Adige, after a heavy loss. Then followed a short period of glory for Austria; for though Napoleon was master of the city of Vienna, he lost his prestige in the sanguinary repulse which the Archduke Charles inflicted on him at Aspern; and the Austrian capital was so crowded with wounded and dying French soldiers, that, if not reinforced by some extraordinary intervention, it is quite possible that Vienna in 1809 might have been to the great captain what Moscow was to him in 1813. Unfortunately for the Austrian cause, the Archduke John had before this been ordered to retire from the north of Italy, and to unite with the main army near the metropolis.

Every old soldier knows what must have been the effect of such a command on a hitherto successful army, which was ordered to retreat over the parched plains of Italy, and then through mountainous tracts, for a vast distance.

Losing the heavy train and guns of a noble army of 40,000 to 50,000 men, he eventually reached Presburg on the Danube with scarcely the half of that number. But whilst this was the poor relief brought to the left flank of the Austrian army, what was the reinforcement which the Emperor of the French received in Vienna? Why, that of the very generals and soldiers who had been held at bay by the Austrians in Italy. These were now converted into a triumphant advancing force, which, when led by Macdonald, enabled Napoleon to win the hard-fought day of Wagram.

Singularly modest, he never spoke of his own conduct; but, extracting information from those who had been his companions during those terrible campaigns, I firmly believe that when the truth is ascertained, the deceased Archduke will be entirely exonerated from the blame, attributed to him by historians, of not having promptly aided his brother Charles in the battle of Wagram; the fact being that the counter-orders sent to him prevented his coming up till the main Austrian army was in full retreat.

Naturally disappointed and disgusted at the results of a war which had humbled Austria after her heroic efforts, the Archduke betook himself to those mountains of the Styrian Alps where I first made his acquaintance, when exploring their defiles in 1829 in company with Professor Sedgwick. At his favourite Bad-Gastein he welcomed us with frankness and cordiality, and after a table d'hôte dinner at mid-day, where ministers, generals, and geologists, were all commingled, we made a most enjoyable excursion to the foot of the snow-covered peaks which the Prince had ascended, and of which he gave us minute mineral descriptions. Never shall I forget the joyous conversation he maintained, always full of noble and liberal sentiments, until late in a fine starry, moonlight night we regained our hostelry. Nor can I be oblivious of the kindness with which on another day, just after sunrise, he laid out upon the floor of his little bed-room at the curate's house a large and detailed map of all parts of the Austrian Alps, and how we went upon our knees with himself whilst we examined upon the map every recess of those mountains.

In the following year, being at Vienna when the present Emperor was born, I met with marked attention from the Archduke John, who was the chief of the Engineer corps; but it was on revisiting Grätz, where I had been in the previous year, that I best learnt how to admire him. There it was that he had already established that scientific institution, the Johanneum, in which the natural history productions of the Austrian Alps were so admirably displayed, and where able men, attracted thither by the good Prince, expounded the truths of geography, botany, mineralogy, and mining.

It is enough to say that here taught and wrote my eminent and valued friend Haidinger, now worthily at the head of the geologists of Austria, who took a leading part in founding the Imperial Geographical Society, and who is constantly affording us valuable information. It was by visiting the valleys of those Alps in these and subsequent years, where the industry of the honest and trusty Styrian works the iron-mines, that I could still better estimate the noble and disinterested character of this true-hearted Austrian Prince.

Visiting him at Frankfort in 1848, when he was Reichs-verweser of the German Confederation, and calling on him at his first and only hour of leisure, six in the morning, I learnt from himself that he sighed to regain those mountains amidst which I had known him to be so happy. Thither he did return, and there ended his days in the society of the wife of his choice, and blessed with an accomplished and promising son, the Count de Meran, now in the Austrian army.

The Archduke John, who had visited England and remained some time in the year 1816, had a true regard for many of our countrymen with whom he associated; and of those now living, I have especially heard him speak in affectionate terms of that pattern of an English gentleman, our associate, Sir Thomas Dyke Acland.

As not only Austria but all Germany mourns his loss, so your President, who was honoured with his friendship, has striven to do honour to this virtuous and distinguished member of the Imperial house of Hapsburg.

M. Gerold MEYER, of Knonau, the noted Swiss historian and geographer, who died recently, was one of our foreign Correspondents. Being the keeper of the archives of Zürich, so rich in the original documents relating to the history of Switzerland from the ninth to the fifteenth century, he detected letters which some English readers will find an interest in perusing, viz., the correspondence of our Elizabethan divines with the Swiss reformers, which will, I understand, be published by the Parker Society under the name of Zürich Letters. M. Meyer was the author of the 'Erdkunde der Schweiz,' and the projector of, as well as largely a contributor to, that instructive work the 'Gemälde der Schweiz,' of which nineteen volumes have been published.

ROBERT BROWN.—At the head of the men of British science who have been taken from us since the last Anniversary, I at once place the name of that eminent Scotchman, Robert Brown, who, having earned for himself the title of the "Prince of Botanists," had won, at the same time, our kindest remembrance for having taken an active part in the foundation of this Society.

Born at Montrose in 1773 (his father being the Episcopalian minister of that place), young Brown there received his early education, which was completed by a course of studies in the Universities of Aberdeen and Edinburgh. From 1795 to 1799 he served as assistant-surgeon, with the rank of ensign, in a Regiment of Scottish Fencibles; and it was in the last-mentioned year (after the Irish Rebellion was quelled) that, during a leave of absence, he was kindly befriended by Sir Joseph Banks, who shortly after proposed to him to become the naturalist of that world-wide scientific expedition which, sailing in 1801, and returning in 1805, enabled our deceased member to make collections, discoveries, and comparisons in Australia and other distant lands, which threw an entirely new light on the geographical distribution of vegetable life.

As the late President of the Royal Society has already pointed the attention of men of science to the chief works of Robert Brown, and as, doubtless, his memory will be still more minutely scanned by the President of the Linnean Society, of which body he was the main-stay for many years—whether as Librarian, Secretary, Vice-President, or President—it is unnecessary that I should on this occasion enumerate all those publications on which his fame rests. For these works he received numerous distinctions, having been elected an honorary member of every academy in Europe, including that eminent scientific honour, of being one of the eight Foreign Associates of the French Academy of Sciences; whilst he had also received from the Royal Society the highest distinction of that body —the Copley Medal.

In reference to our own Society, let me say that, in 1830, Robert Brown, who was a constant attendant at the Raleigh Club of Travellers, united with Sir John Barrow, Mr. Hobhouse (now Lord Broughton), Mr. Bartholomew Frere, myself, and other members of that club, in drawing out rules and a plan for the establishment of a projected Royal Geographical Society. For this purpose we held several meetings as a provisional committee, at all of which Mr. Brown was present. We also printed documents explanatory of our project, which were duly circulated, including the laws which still regulate the Society, and which, on my own proposal, were essentially those of the Geological Society.*

As no words of mine can do sufficient justice to the merits of a man whose eulogy has been, or will be, channted by all the eminent botanists of the age, I willingly extract some sentences of a letter which I received a few months ago from Baron Humboldt, who, after alluding in feeling terms to the death of his former companion Bonpland, and to the oldest of the three (himself) being left alone, thus speaks of our deceased member:—"The enormous loss of "Robert Brown is perhaps more deeply felt in Germany and "other countries than in England. It was the protection af- "forded to me as early as 1799 by Sir Joseph Banks which first "made me acquainted with that Robert Brown who afterwards "gave so vast an impulse to the three great objects which must for "ever remain attached to his name—the minute development of "the relations of organization in natural families, the geography "of plants, and the estimate of their numerical proportions. The "physiology of plants, and an elaborate dissection of them, con- "stituted invariably with him the foundation of all systematic "botany. In short, Bonpland, Kūnth, and myself had the happiness "in 1822 thus to dedicate to him our 'Synopsis of the Equinoctial "Plants of the New World:'—

"ROBERTO BROWNIO
Britanniarum Gloriæ atque Ornamento
Totam Botanices Scientiam
Ingenio mirifico complectenti."

These remarkable words, coming from such a source, and constituting an epitaph which should be inscribed on the tomb of the great botanist, were written seventeen years before he received the highest honour of the Royal Society, and thirty-six years before his decease.

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* It is here my duty to state that of which I was unaware when the Society was founded, that another individual had early in 1830 not only sketched out the establishment of a Geographical Society like our own, but had enrolled in it many names. That person was my esteemed and distinguished predecessor, Admiral W. H. Smyth, whose services to us were afterwards tested by the skill and zeal with which he administered our affairs; and who, by giving a new impetus to us when we were in a declining state (1849), was really the renovator of our body.

The truth of the above-mentioned remark of Humboldt, that the loss of Robert Brown has been more felt in Germany and other countries than in England, has very recently been realised by the publication of an eloquent éloge of the deceased by his great German botanical contemporary, our associate Dr. Ch. von Martius, of Munich, who opens his essay by declaring that, next to Linnæus, the three other names ever to be memorable in the history of botany are those of Jussieu, De Candolle, and Brown.

Referring my hearers to the full translation of this treatise * for the clearest definitions of the researches and discoveries of the deceased, in establishing the surest foundations of phytogeography, as dependent on the morphology, development, geography, statistics, and history of plants, let me cite one or two sentences from the essay of the eminent Bavarian:—

"Not one of those essential parts of the plant on whose manifold forms and combinations depends the glorious wealth of the vegetable kingdom was passed over by the searching eye of Robert Brown. From the microscopic germ of the moss and the vegetable ovule to the flower; from the stamen and its pollen to the carpel and the fruit, he examined and compared all the organs in plants, of the most diverse orders, and in all stages of development.

"Governed by the deepest sense of natural truth and natural relations, he established the soundest views upon the nature and developmental history of these organs. Thus he vastly contributed to the consolidation of that theory (morphology) which gives to systematic botany its true claim to rank among the sciences.

"In these morphological researches of Robert Brown there was a peculiar affinity to the spirit of the Germans, and thus this is a deep-rooted cause of the powerful influence which he has exerted upon botany in our country."

After a lucid and critical review of his scientific labours, Dr. von Martius passes to the consideration of what he justly terms the fairest and most glorious aspect of the man—his moral nature. And here, together with all my countrymen who knew Robert Brown, I can bear witness that our foreign contemporary has struck the right note when he thus speaks:—

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* *See* 'Annals of Natural History,' vol. iii. p. 231.

"Robert Brown was a truly great and good man. Love of truth above all things, calmness, sincerity, modesty, tender sensibility, and goodness of heart—these features of his character stood constantly under the government of a penetrating and massive judgment. So energetically did these characteristics regulate his activity as inquirer and author, that we may affirm that every act of his investigations, and every assertion in his writings, bear the stamp of this perfectly-balanced character.

"It is indeed often the case that an extraordinary intellect rests, like a column, upon a slender moral foundation; but Robert Brown's rose, like a pyramid, from a broad and strong base. In recognition of this worthy combination, all naturalists offered admiration to his intellect—to his character, reverence and love."

"It has been thought strange," continues Dr. von Martius, "that a man of such extraordinary scientific importance, to whom the homage of the world was offered, played no prominent part in public life, or in the brilliant society of London."

On this last point I may, however, say that, although my deceased friend communicated much pleasure to others when surrounded by a small social circle, he had little relish for fashionable or political society. Still it is deeply to be regretted, that those who occupy lofty stations in our land should not have better appreciated so remarkable a countryman. Indeed, I cannot forget the remark made to me by Humboldt when, in 1842, in accompanying the King of Prussia to England, he honoured me by meeting the "Princeps Botanicorum" at my own house, "that it was painful to him to find that a man of such true eminence as Robert Brown was almost ignored among the higher circles of English society."

I may state that, in the latter years of his life, this great botanist devoted much of his time to the minute examination of those fossil plants, the structure of which is admirably exhibited by having been preserved in crystalline matrices, siliceous or calcareous; and he spared no expense in having these specimens so cut and polished as to facilitate the endeavours of his successors to follow up a line of research in which he modestly styled himself only a pioneer.* For, although he had established some of the noblest generalizations in the relations and classification of living plants, he was much too sagacious and circumspect to pronounce hastily on the affinities between the lapidified, extinct groups of vegetables and those which now prevail.

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* His highly instructive collection of fossil plants has been bequeathed by Mr. Brown to the British Museum, on the condition of the Trustees allowing it to form part of the Botanical Exhibition, under the charge of the Keeper of Botany. This provision has been complied with; and the collection, as well as the inimitable portfolios of the drawings of Ferdinand L. Bauer, also left to the Trustees, are now under the charge of Robert Brown's valued friend, Mr. John Bennett, his successor as Keeper of Botany in the British Museum.

Those persons who, like myself, were intimately acquainted with this distinguished and benevolent man, can testify that in every action of his life he preserved the most scrupulous rectitude of conduct, dictated by the sincerest love of truth;* and that, whenever occasion required, he gave ample proofs of a lofty and independent spirit. No event within my recollection called forth, in a more marked manner, his love of independence, than when, in the year 1830, a great majority of the men of science having publicly expressed a wish that Sir John Herschel should become the President of the Royal Society, a Prince of the blood royal was proposed in opposition to the man of our choice. Then it was that, cooperating with my deceased friend, I saw the influence produced upon my associates by the honest and unflinching exertions of this respected leader in science. The result of that struggle, as is well known, was the election of the Duke of Sussex by a small majority; whilst it is a fact highly creditable to the memory of that kind-hearted and accomplished Prince, that he subsequently lost no opportunity of paying marked attention to those Fellows of the Society who had conscientiously supported his opponent, at the head of whom stood Robert Brown. In truth, his Royal Highness, to his great honour, farther distinguished himself, in the year 1838, by welcoming Herschel on his return from the Cape, and by presiding over the entertainment given to that great astronomer by 400 men of science, at which I had the honour of acting as a vice-president in union with Robert Brown.

As an attached friend of the dying philosopher, it was my privilege to witness how his noble, calm, and unruffled spirit was preserved to the last ebb of life; and it was a sad but gratifying solace to me, that I was one of those of his scientific associates who, well knowing how to estimate the value of the man, had the privilege of following to the grave the remains of the truly illustrious Robert Brown.

HALLAM.—The celebrated historian, Henry Hallam, has gone from among us, full of years and of honour. Many an abler pen than mine will, doubtless, pay just tributes to his memory, though no one of his friends entertained a deeper regard for him than myself.

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* My friend Dr. Fitton also possesses a letter from Baron Humboldt to himself, in which the great traveller, besides an enumeration of the works of Robert Brown, also dilates on his many private virtues, as well as on the simplicity of his character.

Disdaining to court popularity, and dealing sternly with those whose writings or conduct savoured of untruthfulness, he possessed at the same time as kind and as genial a nature as it was ever my good fortune to estimate. Admiring his character throughout no short space of time, I can fairly say that with every year my respect for him increased. Whether I watched him and felt for him when his strong mind was bowed down by those domestic afflictions which succeeded each other in so lamentable a manner, or when, rising out of his sorrows, he poured forth his terse and forcible conversation, and was the charm of that social circle in which he shone, even amidst such contemporaries as Sydney Smith or Samuel Rogers; in every trait of his life he won my regard, and invariably impressed me with the sincerest esteem for his whole character.

Having gained a wide renown as a man of letters, Mr. Hallam had a real pleasure during the last quarter of a century in upholding and supporting all those branches of knowledge, whether in science or in art, which elevate humanity. Thus reverting to the mathematical pursuits he had cultivated at Cambridge, he was elected a Fellow of the Royal Society in 1821; and seeing how the then new science of geology was opening out great and fundamental truths of nature, he also willingly joined the Geological Society. In 1830 he was one of those who founded the Royal Geographical Society, and having been more than once upon our Council, he invariably afforded us his warmest support, and has often spoken to me in commendation of our Journal.

Among the numerous honours which were deservedly heaped upon him by the various academies of Europe, there was no distinction which Mr. Hallam justly valued more, than that of being selected as the Historiographer of the Royal Academy of Arts of this metropolis. Succeeded as he has worthily been in that post by my eminent friend Mr. Grote, I may here be permitted to quote a few words of the eloquent eulogium which at the last anniversary festival of the Royal Academy fell from the lips of the author of the 'History of Greece,' as illustrative of the character of his great predecessor:—

"There lives in his chapters a conscientious sense of the almost judicial obligation of an historian, the obligation of studying with care original and contemporary authorities, but at the same time of rising above contemporary prejudices, and of judging with equitable independence the ever-renewed and ever-varying party-conflicts in history. I know no compositions in which these first conditions of historical worth, copious original research, and equitable criticism, are more constantly combined than in those of Mr. Hallam. And it is, in my judgment, an additional merit that his History is devoted to the gown rather than to the sword; that he has left to others the exciting tales of battles and sieges, of exhibitions of armed force, either in strategic movement or tumultuous outbreak—*pugnas et exactos tyrannos*—which have always charmed the popular mind in description, however distressing they may have been, in the reality, to the generations that underwent them. Mr. Hallam has set before us the energies of the unarmed citizen; the pacific manifestations of the human mind, in its legal and institutional development; in philosophy, literature, and poetry; and though last, not least, in those Fine Arts which form the collective bond of sympathy among the present company. To succeed to an historian who to these literary accomplishments added all the social excellences of an English gentleman, is a distinction of which any living author may be proud."

As a Trustee of the British Museum, Mr. Hallam's just appreciation of works of ancient art, and his thorough acquaintance with the rarest books, were combined in him with the soundest judgment in the management of the establishment; and when his last illness fell upon him, and deprived the Board of his solid advice, every trustee felt that he had lost the invaluable support of a just and enlightened associate.

The chronicler who may endeavour to render justice to the memory of the deceased will necessarily dwell upon those records of the Middle Ages which demonstrate how our liberties arose, and then follow out the processes by which our freedom was consolidated and maintained, as put forth in that noble work 'The Constitutional History of England,' which breathes such a racy love of free and well-balanced institutions.

It is my humbler province only to indite these few lines expressive of my admiration of the scholar and historian who was an honour to our age, and to record with just pride that I had the privilege of enjoying the personal friendship of the great, good, and virtuous Henry Hallam.

THE EARL OF RIPON.—In continuing this Address as usual with some allusions to the Fellows of our Society who have been taken from us in the past year, I will not endeavour to put before you a chronicle of the progress of each person through life, but simply dwell on those circumstances which connect that individual with our geographical pursuits, accompanied by a very brief sketch of his public character.

In alluding to public men, I naturally first notice the career of the patriotic and accomplished nobleman, our first President, the Earl of Ripon, who, having reached his seventy-seventh year, died in January last. Entering into public life in 1804, and into Parliament in 1806, Lord Ripon was connected by official duties with the successive Governments of the Duke of Portland, Lord Liverpool, Lord Castlereagh, and Mr. Canning, and on the death of the last of these statesmen was, when Viscount Goderich, for a brief space the Premier. Subsequently he joined the Ministry of Earl Grey, and was Secretary for the Colonies at the time when, at the request of some of the founders of this Society, he became our first President. During the period of his Presidency he never failed to take a lively interest in our welfare; but feeling that the duties attached to an important office in the State were incompatible with a due attendance to our concerns, he relinquished the office into the hands of his friend Sir John Barrow, who had, in fact, taken an active part in inducing his Lordship to become our leader.

Though the late Lord Ripon retired from office in 1834, yet on the return of Sir Robert Peel in 1841 he undertook first the Presidency of the Board of Trade, and afterwards that of the Board of Control, which last place he held until the dissolution of Peel's Government in 1846, when he retired from public life.

In this last official post Lord Ripon showed an anxious desire to promote, by every means in his power, the advancement of scientific and useful researches in the interior of India, as I can testify; for upon my representing to him the great advantage which would accrue from selecting by preference those medical students who had received a good scientific education for Indian service, he willingly nominated as an assistant-surgeon the son of my venerated friend Dr. John Fleming the celebrated Scottish naturalist, and Dr. Andrew Fleming has since well requited his Lordship's aid by arduous geological and other researches.

Though it is not within my province to trace the public life of the late Lord Ripon, still it is very gratifying to me to be able to say that he was invariably and intimately connected with all the liberal parliamentary measures which were passed during his official career. Thus, whether we turn to the long debates which led to the emancipation of the Catholics, the abolition of the Slave Trade, the repeal of the Corn Laws and of the Test and Corporation Acts, and even to the Reform Bill itself—to one and all of these national enactments he gave his steady support. He was, indeed, mainly instrumental in propounding one of those great questions—a change of the Corn Laws—to the House of Commons, and finally he carried another (the Abolition of Slavery) through the House of Peers.

Of our first President let me also say, that in the last years of his life he was specially exempt from that failing—the passion for worldly distinctions—which, usually increasing with advancing years, has of late prodigiously increased. For although he might surely have obtained the honourable distinction of a broad riband at the hands of his Sovereign for his long public services, he never sought it, but lived on unostentatiously and happily in the bosom of his attached family, and surrounded by friends who best knew how to appreciate his private worth and public virtue.

Warburton.—In the decease of Mr. Henry Warburton I have lost one of my earliest geological friends, to whom I was indebted for much sound advice and assistance when I first wielded the hammer of the geologist, and became an author.

Mr. Warburton, who had received a good classical and mathematical education at Cambridge, where he was distinguished, devoted himself much to the pursuits of physical science. At the early age of twenty-four, and in the year 1809, he became a member of the Royal Society. Joining the Geological Society in 1808, or soon after its foundation, we find that in the year 1814 he was already one of its secretaries, his friend Wollaston being then also upon the Council, and in 1816 he became a Vice-President of the same body. When the Geological Society acquired a Royal Charter, the name of Henry Warburton was associated with the names of William Buckland and George Bellas Greenough in the deed of incorporation. The progress and welfare of that Society were, indeed, ever dear to Mr. Warburton; and although his name appears rarely in the Geological Transactions (his principal memoir being on the Bagshot Sands),* I can appeal to all his surviving geological contemporaries for a confirmation of the fact, that his literary labours were unceasing, whether in drawing up those rules and regulations whereby the rising Society was held together, or in assiduously preparing for the press any memoir which was communicated by an unpractised writer.

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* Transactions of the Geological Society, vol. i., 2nd series, p. 48.

In subsequent years, and when he sat in Parliament (i. e., from 1826 to 1848), Mr. Warburton was placed during the years 1843-4 at the head of that Geological Society for which he had so long and so zealously laboured; but regardless of his own reputation, and occupied with public affairs and close committee work in the House of Commons, he neglected to write out and print his Anniversary Addresses, though he delivered them extempore and with much effect from the chair in Somerset House.

It will ever be remembered to the honour of our deceased member, that he was the intimate friend of the illustrious Wollaston, of whose writings and discoveries he was well qualified to judge; for Henry Warburton was never superficial, and every subject with which he grappled was thoroughly mastered. As in commencing my scientific career I looked up to him as a guide, so shall I never forget my last interview with Wollaston a few days before his death, when Warburton, in watching over his friend, was taking down the words of that bequest which the great philosopher made to the cultivators of the science of geology.

The unwillingness of Warburton to appear as an author in his own name, founded, I believe, on his keen sense of the necessity of rendering every phrase precisely accurate, soon after proved of signal disadvantage to the memory of the man who of all others he most truly loved and respected. The biography of the great Dr. Wollaston had to be written, and Warburton undertook the task; and though I have reason to think that he had made some progress in the work, he never completed it. That this delay prevented the Éloge of Wollaston being penned by Cuvier himself, is, indeed, too true, inasmuch as that great man, then Perpetual Secretary of the French Academy of Sciences, urged me (during one of my visits to Paris) to induce Mr. Warburton to delay no longer, and furnish him with the necessary materials to do justice to our deceased countryman, as one of the eight Foreign Members of the Institute. Yet with all this procrastination as respected the publication of any work in his own name, Mr. Warburton, I repeat, afforded constant literary aid to all those who were struggling on to advance science, and was, in truth, a terse and lucid writer.

In like manner his Parliamentary contemporaries will, I am sure, bear me out when I say, that if a bill had to be accurately and perspicuously drawn, or the Report of a Committee to be well put together, Mr. Warburton would spend days and nights in the laborious work, which was to him a labour of love. The voluminous Report on the Coal Trade of England, published by order of the Houses of Parliament, is one of the most pregnant proofs of his assiduity as a compiler, and, at the same time, of his knowledge as a geologist.

His Anatomy Bill, in the carrying out of which he laboured many years, is also to be specially mentioned in dwelling upon his scientific merits; whilst those who contend for the advantages flowing from such a thoroughly liberal system of education as has been sustained by the eloquence of a Brougham, a Mackintosh, a Romilly, and others, will never cease to respect the memory of Henry Warburton as one of the founders of the University of London, and a most zealous champion of its rights and liberties.

Retiring from public life in 1847, he returned to his early relish for mathematical studies, and produced two papers "On the Partition of Numbers," and "On Permutations and Combinations," which were printed by the Cambridge Philosophical Society. A scientific contemporary has said, that "both these papers show a great command over the German factorial notation, and add several curious theorems to their subjects."*

In private life Mr. Warburton had many attached friends, among whom I was one, in common with Wollaston, Chantrey, and many of those cultivators of science and art who, setting aside some peculiarities of manner, esteemed him for his strong mind, sincerity, and worth.

Those who, like myself, truly valued the man, and who visited him in his house in Cadogan Place, had to pick their way through piles of books and bottles of acid, with which every room, and even the passages, were encumbered, until they reached the attic, into which the philosopher was driven. But this singular mode of life was not caused by parsimony; for Mr. Warburton was most liberal in his donations for the advancement of knowledge, and in addition to large sums contributed in many other ways, I may state that he gave 1,000*l.* towards the publication of the first geological map of England, as prepared by his distinguished associate, one of our former Presidents, the late Mr. Greenough, like whom he was one of the earliest members and supporters of the Royal Geographical Society.

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* President's Address to the Royal Society, 'Proceedings R. S.,' 1858, p. 556.

Lieutenant Henry RAPER,* eldest son of the late Admiral Raper, so well known for his improvements in maritime signals, was born in the year 1799, and entered the navy at the early age of twelve, on board the *Mars*, of 74 guns, commanded by his father. Shortly afterwards he went to the Royal Naval College at Portsmouth, where he won the silver medal for his acquirements in mathematics.

Having passed a distinguished examination at the College, Mr. Raper returned to service afloat, and was some months in the *Nymphea* frigate. In October, 1815, he joined the *Alceste*, of 38 guns; which ship, after conveying Lord Amherst as ambassador to China, was lost on her homeward voyage, by striking on a sunken rock in the Strait of Gaspar, on the 18th of February, 1817. Here he participated in all the hardships experienced on the rocky islet, Pulo Leat, to which the crew escaped; there they were in danger of death from thirst, and constantly threatened by ferocious Malay pirates, whose proas, to the number of sixty, completely blockaded them. After being relieved from this critical situation by vessels despatched from Batavia, Mr. Raper served successively on various stations in the *Tyne* and *Seringapatam*, till, at his father's express wish, he joined the *Adventure*, sloop of war, commanded by Captain W. H. Smyth. The service which this ship was then employed upon in the Mediterranean gave him an opportunity of improving his talents in navigation, surveying, and nautical astronomy: and he was placed in charge of the chronometers, in conjunction with his former college-associate the late unfortunate Captain Graves, who was murdered at Malta in August, 1856. Having been promoted to the rank of Lieutenant on board the *Euryalus*, from which frigate he was shortly afterwards removed into the *Dispatch*, Raper remained in that brig until she was paid off, in 1824. When the late Admiral Beechey, who had been one of the *Adventure's* officers, was commissioned to the *Blossom* in January, 1825, for his interesting voyage to Behring Strait *viâ* Cape Horn, he placed the filling up of three vacancies in the hands of his former commander, Captain (now Admiral) Smyth. One of these being the post of First Lieutenant, the Captain pressed its acceptance upon Raper, and had nearly prevailed; but an erroneous notion that a slight which the Admiralty had shown to his father might be visited on him, made him at last decline.

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* This sketch of the career of Lieut. Raper is contributed by my eminent friend Admiral Smyth.

Having thus virtually abandoned the active line of his profession, he betook himself very assiduously to the cultivation of its scientific departments; and his efforts were crowned with such success that his name must ever be enrolled among the improvers of hydrogeographical knowledge. In 1832 he was selected by the Admiralty to form one of a committee to improve the method of measuring the tonnage of ships; and the Report, which was principally drawn up by him, was equally clear and convincing.

In connexion with this Society, of which he was one of the earliest members, has Lieutenant Raper repeatedly served on our Council. In 1840 he published his 'Practice of Navigation,' a book of sterling merit, for which we awarded him the Gold Medal in the following year. That this prompt appreciation of the work was a just one, was evidenced by its being soon afterwards adopted in the Royal Navy, and by the ships of the East India Company. Moreover the third edition of it was noticed from this chair by Admiral Smyth, in 1850, as well generally for the useful additions engrafted on its pages, as particularly for its admirable and well-organized table of 'Geographical Positions' of all the places on the globe; and which, with infinite skill and labour, he increased from 2,300 to no fewer than 8,800. In this edition he also introduced those significant symbols for the admission of great local information in a limited space, which promise to render chorographic details of readier reference than under any other form; and the whole is so stamped with worth as to prove unequivocally the industry, method, and varied attainments of the author.

This highly useful book was to have been followed by a second volume containing a theoretical discussion of all the data and details contained in the first—in fact, to prove analytically what he had expounded synthetically. As this work advanced it assumed increased importance, from combining astronomy, geodesy, mechanics, geometry, and physics; but, unfortunately, he did not live to complete it. His manuscripts are left, but from their unarranged state and nature, their publication is rendered very unlikely.

Lieutenant Raper became a Fellow of the Royal Astronomical Society in 1829, and not only served upon its Council repeatedly, but for several years filled the important post of Secretary, with credit to himself and advantage to the Society. He maintained his habitual cheerfulness and continued his labours to the last; insomuch that in July, 1858, he communicated to the Astronomical Society his improved method of 'Clearing a Lunar Distance.'

Meantime his malady increased, and he died at Torquay, in January last, in the 60th year of his age. His death has occasioned a blank in pursuits which require a mind of no common order, and his loss will be severely felt by his widow and a numerous circle of friends.

Sir Arthur de Capell BROOKE, who died recently at his seat of Oakley in Northamptonshire, like several other associates who have been recently taken from us, was also one of our earliest members. Though a person of retiring and unostentatious habits, who seemed to have no desire to take that part in public life for which his descent, property, and station befitted him, Sir Arthur had all the spirit of an adventurous traveller. In truth, it was he who had the merit of establishing the Raleigh Club, which has now merged into the Club of the Royal Geographical Society. An original member of the Travellers' Club, which bore in the first instance a geographical character, our deceased associate felt so strongly that many of the newly elected members did not sufficiently represent the spirit of foreign exploration, that in the year 1821 he induced a certain number of his qualified associates to unite with him in setting up a Dinner Club which should bear the name of the illustrious Walter Raleigh. Of this club, which contained the names of most of our leading travellers, including men who had explored Africa, the Indies, America, and the Polar Regions, Sir Arthur Brooke continued to be President for many years, and during all that period, when dinner clubs were more in vogue than at present, I can testify that it was considered a feather in any man's cap to be elected a member of the Raleigh.

Sir Arthur Brooke was also a Fellow of the Royal Society, and was favourably known to the public as the author of 'Travels in Norway,' a work which gives a striking picture of the physical features and natural history of that rugged land of glaciers and deep fiords.

Mr. William WEIR, who was suddenly cut off in the midst of his active and useful career as a man of letters, and who had distinguished himself by numerous contributions to the periodical and daily press (latterly as Editor of the 'Daily News'), was a sound geographer.

Reared in the Scottish and German universities, and entering into the profession of the law, his strong and cultivated mind could unquestionably have secured for him a high position in public life, had not an incurable deafness compelled him to abandon the long robe and take to journalism. At one time this Society was so fortunate as to secure his services as the Editor of its volume; and having then formed his acquaintance, it gives me pleasure to state that I esteemed him as a sensible, right-minded, and truly learned geographer, as well as a man of the kindliest disposition.

It has been well said of Mr. William Weir that he was master of the library of Europe; for he was in himself an encyclopædia of law, history, literature, biography, and bibliography, as well as of geography. Rightly did some of his surviving friends and admirers endeavour to raise a sum of money as a testimonial to his varied merits, in order to assuage the lot and enlarge the narrow means of those with whom Mr. Weir hoped to spend the tranquil evening of his days. Although the appeal has not yet been adequately responded to, I sincerely trust that those who admired his lofty integrity will still unite to effect the praiseworthy object of thus honouring the memory of William Weir.

The Earl of Haddington, who died at the age of 78, was educated at Christ Church, Oxford, and, as Lord Binning, represented Rochester in the House of Commons from 1818 to 1826. On the formation of the late Sir Robert Peel's first administration, in December, 1834, he was appointed Lord-Lieutenant of Ireland, a post which he held up to the dissolution of the Government. When Sir Robert Peel again took office, in the autumn of 1841, his Lordship was selected for the post of First Lord of the Admiralty, with a seat in the Cabinet; and seeing the usefulness of our Society in the advancement of nautical science, he joined us in that year. He held the chief naval office up to January, 1846, when he was made Lord Privy Seal, and retained that position until the final dissolution of the Peel Government.

His Lordship, although opposed to the Reform Bill and other measures of the Governments of Earl Grey and Viscount Melbourne, adopted the enlarged views of Sir Robert Peel on the repeal of the corn laws and the commercial reforms which followed. After the retirement of Sir Robert from office, the late Earl rarely interfered in politics. In 1814 his Lordship was made a Privy Councillor, and in 1853 he was installed a Knight of the Order of the Thistle. He was Hereditary Keeper of Holyrood Palace, one of the Elder Brethren of the Trinity House, a Trustee of the British and Hunterian Museums, and Deputy-Lieutenant of Haddingtonshire.

Lieut.-General Sir C. Felix Smith, K.C.B.—This distinguished officer, who died at Worthing in August last, aged 71, served in

1807 at the capture of the Danish islands of Santa Cruz, St. Thomas, and St. John; and in 1809 at the siege of Fort Bourbon and the capture of Martinique, where he was wounded. He was senior engineer in charge of Cadiz and its environs, in the operations connected with the battle of Barrosa in 1811, and commanding engineer at Cadiz prior to, and at the raising of, the siege in the following year. He was subsequently present at the combat of Osma, the battle of Vittoria, the actions of Villa Franca and Tolosa, and at the siege of St. Sebastian, in the earlier part of which he acted as commanding engineer. He was afterwards present at the capitulation of Paris, and remained there for some time with the army of occupation.

Sir Felix became a Lieutenant-General in November, 1851, and Colonel-Commandant of the Royal Engineers in 1856. He received a medal and one clasp for his services at Vittoria and at St. Sebastian. In 1814 he was nominated a Knight of the Order of Charles III. for his skill in the gallant defence of Tarifa in 1811. He was Commander of the British military force in Syria, and was severely wounded at St. Jean d'Acre, for which last services he received in 1841 the thanks of both Houses of Parliament.

Sir Belford Hinton WILSON, who was born in 1804, entered the military service of the republic of Columbia in 1822, and attained the rank of Colonel; served as aide-de-camp to General Bolivar from 1822 to December, 1830; became British Consul-General in Peru, April, 1832; Chargé d'Affaires in Peru and in Bolivia, November, 1837; and was Chargé d'Affaires to Venezuela from November, 1842, to November, 1852. He received the Order of the Bath for his diplomatic services.

Major Henry Seymour MONTAGU, a school-fellow and brother-officer of our respected associate Lieut.-General Sir George Pollock, went to India in 1801, and served in the same regiment as the late Sir William Nott. He was afterwards appointed aide-de-camp to the Earl of Minto, and held several high appointments in India. Having returned to England, he travelled extensively on the continent, and was much attached to geographical pursuits. He was also a warm promoter of various charitable societies.

MAJOR-GENERAL SIR WILLIAM REID, K.C.B.—This highly distinguished officer of Engineers was a man of so observant a mind, and was so possessed of sound sense united with a calm but resolute temperament, that he was by nature destined to succeed in any employment he undertook.

Joining the army of Wellington in 1810, he was present as a subaltern officer of engineers at all the great sieges and battles in the Peninsula, from that date until the close of the war, when he obtained his company. He was afterwards present at the bombardment of Algiers in 1816, and commanded the Engineers under Sir De Lacy Evans in Spain.

In 1832, when employed at Bermuda, and when devising the reconstruction of extensive Government buildings destroyed by a hurricane, he was led to follow out that series of inquiries into the causes of such storms, and collected numerous data to work out their giratory character, which had been shortly before put forth by Mr. Redfield of New York. These effects resulted in 'Reid's Laws of Storms,' which work, published in 1838, has passed through several editions, and has been translated into various foreign languages, even into Chinese. By the law which he evolved, he taught the mariner that the old method of running before the wind in such storms might lead to destruction, and that true safety was to be sought by veering to the one side or the other, and thus escaping from the whirlwind.

It was infinitely to the credit of my old friend Lord Glenelg, then Colonial Secretary, that in consequence of the talent displayed in that work, his Lordship appointed Colonel Reid to the Government of the Windward Islands; and I mention this circumstance because science is not often so appositely rewarded.

As an administrator, Sir William Reid was never more distinguished than in methodizing and controlling the proceedings of the Great National Exhibition of the Industry of all Nations, with which our Vice Patron the Prince Consort has so eminently identified his name; and His Royal Highness never better demonstrated his right appreciation of true merit than in warmly acknowledging the value of the services of the Chairman of the Executive Committee of that great undertaking, and in procuring for William Reid the honourable distinction of a Knight Commandership of the Order of the Bath, and the Government of Malta.

Possessing a genuine enthusiasm under a calm and tranquil exterior, Sir William not only thoroughly performed his arduous duties at Malta during the Crimean war, but lost no opportunity of improving the estate committed to his charge, by ameliorating its agriculture, replenishing the old library of the knights, and by founding a botanical school for the working classes.

He died in his sixty-sixth year, sincerely regretted by every one who knew him.

Admiral Sir Charles OGLE, Bart., who died in June last, at the age of 83, was the eldest son of Admiral Sir Chaloner Ogle, who, like his deceased son, died the senior Admiral in the British navy. Sir Charles Ogle took deep interest in, and was a munificent contributor to, the different charitable institutions connected with the naval service, and had been for many years President of the Royal Naval Benevolent Society.

Vice-Admiral Percy GRACE, a distinguished officer of the old war time, was the brother of Sir W. Grace, Bart.

He began his naval career in 1801 on board the *Ganges*, 74, and was present at the battle of Copenhagen. He next served on the East and West India and North American stations; and when in the *Greyhound*, distinguished himself at the capture of the *Pallas* French frigate and two armed Indiamen. He was then wrecked, and became a prisoner at Manilla and Batavia. Being in the command of some boats as a Lieutenant, he captured two Malays, after a sharp fight, and was wounded. In the boats of the *Semiramis* frigate, he contributed to the capture of five French vessels, four miles up the Gironde; and about March, 1810, he received the well-merited thanks of his captain for the part he took in the capture of *Le Pluvier* of 16 guns. It was not till June, 1814, after having seen more service on the coast of North America, that he was rewarded with the rank of Commander. In command of the *Cygnet* he displayed much activity on the coast of Africa and in the Mediterranean; and subsequently he became senior officer in the Levant. He was made Post Captain in 1825, and had been an Admiral a few years when he died, to the regret of numerous friends.

CAPTAIN SIR WILLIAM PEEL, R.N.—Of all the naval worthies who have recently been taken from us, no one has been so mourned for by the nation as that chivalrous and noble seaman William Peel, the third son of the late illustrious statesman. It is not for me to attempt to detail his daring exploits in the Black Sea, or when in heading the Naval Brigade in the late Indian warfare he showed what efficient services could be rendered to the army by his hearty and devoted co-operation.

Serving at St. Jean d'Acre as a midshipman, under Admiral Sir R. Stopford, he obtained the rank of Commander in 1846. After distinguishing himself in the Black Sea and Crimea, where he was wounded, he was employed in the Chinese seas, when, providentially for our Indian empire, he was sent directly with troops by Lord Elgin to Bengal, to aid in quelling the mutiny. Ascending the Hoogly in the *Shannon* to Allahabad and Cawnpore, we all know how, by his energy, heavy guns were brought into action, and how materially he contributed to the capture of Lucknow, in which operation he was again wounded. Alas! that after these triumphs he should have been cut off by smallpox at the early age of thirty-three!

In truth, every Englishman who looks mainly to our navy for the preservation of our independence as a nation must deplore the loss of such a hero at a critical period in our history, when the defences of the country so seriously occupy the thoughts of all persons, and particularly of all old soldiers and sailors.*

Apart from his glorious but too short naval career, Captain Sir William Peel had the true spirit and capacity of an explorer, and had indeed already proved that he was a real working Fellow of the Royal Geographical Society. His journey across Nubia † under the severest privations convinced us that into whatever part of the world he roamed, whether as a traveller in search of the truths of Nature or in following the path of duty, he was unquestionably one of those who, had he been spared, would have materially enriched geographical science.

In short, whether we appeal to his brave messmates of both services by whom he was sincerely beloved, to the explorers of distant lands among whom he had enrolled himself, or to the public at large, most certain is it that few men have ever fallen in the country's cause who have been more affectionately remembered than William Peel.

Commander George Frederick MECHAM, R.N., one of our Arctic heroes, has been taken from us at the early age of thirty.

He was promoted for his valuable Arctic services in the expeditions of Captains Austin and Belcher, 1850-4, during which he made the longest overland search on record. On his return he was appointed to the command of the *Vixen*, and, whilst in command of that vessel, died suddenly at Honolulu of bronchitis. Shortly before his decease he sent to this Society a paper on the different specimens of sulphur, boracic acid, &c., collected by him at the volcano of Kilanea.

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* *See* the able work on our National Defences, by that distinguished strategist of the days of the Peninsula and Waterloo, my valued friend Lieut.-General Shaw Kennedy, C.B. (Murray, 1859.)

† 'Ride through the Nubian Desert.' (Longman.)

Commander Paulson, R.N., closes the list of naval officers who have been taken from us. He served in the Burmese war as a Lieutenant, and attained the rank of Commander in 1842, when the *Royal George* yacht was placed under his orders.

Sir James Ramsay, Bart., of Banff House, Perthshire, and the eighth Baronet of the name, who died in January last, was a lover of scientific pursuits and a respected country gentleman.

Sir Edward North Buxton, Bart., who died at the early age of forty-five, was son of the justly respected Sir Thomas Fowell Buxton, whose name is for ever associated with the emancipation of the African negro. He was born in 1812, succeeded to the Baronetcy on his father's death in 1845, and in 1847 was elected as representative for South Essex. In 1855 he was obliged to go abroad with his family on account of his health, and he spent the winters of 1856 and 1857 chiefly at Nice. His visit to Piedmont will long be particularly remembered, on account of the beneficent influence which he exercised in calming down that unseemly strife which had divided the Italian from the Vaudois Protestants. In this good work he persevered, and he deemed it so important that the true character of the Italians should be clearly known, that he took a journey from Cromer last September purposely to state his views to the religious conference assembled at Berlin.

Rev. Dr. Jenkyn.—The late Rev. Dr. Jenkyn displayed in early age a thirst for knowledge, which distinguished him through life. Placed under the able tuition of the late Rev. Dr. Pye Smith, he formed a friendship with him which lasted till death; and from that excellent man he doubtless derived that love of natural science which was so marked a feature of his intellectual character.

His ardent attachment to geological science is well known, and his 'Elementary Lectures on Geology' in a popular educational periodical were characterised by a leading member of the Geological Society as being the best work of the kind for the masses that he had seen. In 1853 he was elected Fellow of the Royal Geographical Society. He died at Rochester, deeply and deservedly regretted by those who knew him, in the sixty-fourth year of his age.

He published works on religious subjects to which it is not my province to advert, and was for some years President of Coward College, London.

Mr. Richard Taylor, the well-known printer and accomplished naturalist and scholar, was born at Norwich in 1781. In the year 1807 he became a Fellow of the Linnean Society, and in 1810 was elected its under-secretary, an office which he retained for nearly half a century, and in which he earned for himself the cordial esteem and good-will of every member of the Society. In his diary, under date of the anniversary of 1849, he notes that he had "served with the naturalists M'Leay, Bicheno, Boott, and Bennett, under the successive Presidencies of the founder, Sir J. E. Smith, of the late Earl of Derby, the Duke of Somerset, and Dr. Stanley Bishop of Norwich." To the names of these Presidents he might subsequently have added those of Robert Brown and of Thomas Bell, the actual President of the Linnean Society, by both of whom he was highly esteemed for his strict sense of honour, his amiable disposition, and his entire devotion to the interests of the Linnean Society.

Among the numerous other learned bodies of which he was a member, the Society of Antiquaries, the Astronomical Society, and the Philological were those bodies in which he took the deepest interest. He also attached himself from its commencement to the British Association for the Advancement of Science, many of the meetings of which he regularly attended, and at which he was always cordially welcomed by numerous friends, including myself.

In 1822 he joined Dr. Tilloch as editor of the 'Philosophical Magazine,' with which Dr. Thomson's 'Annals of Philosophy' were subsequently incorporated. In 1838 he established the 'Annals of Natural History,' and united with it, in 1841, Loudon and Charlesworth's 'Magazine of Natural History.' He subsequently (at the suggestion and with the assistance of some of the most eminent members of the British Association) issued several volumes of a work intended especially to contain foreign papers of a high order of merit, translated into English, under the title of 'Taylor's Scientific Memoirs.' But his own principal literary labours were in the field of Philological research. In 1829 he prepared a new edition of Horne Tooke's 'Diversions of Purley,' which he enriched with many valuable notes, and which he re-edited in 1840. In the same year (1840) Warton's 'History of English Poetry' having been placed in his hands by Mr. Tegg the publisher, he contributed largely, in conjunction with his friends Sir F. Madden, Benjamin Thorpe, J. M. Kemble, and others, to improve the valuable edition published in 1824 by the late Mr. Richard Price.

Early in the summer of 1852 his health gave way, and he found it necessary to withdraw from the excitement of active life. Increasing years brought increasing feebleness; and the severe weather of November last brought on an attack of bronchitis, of which he died.

Mr. Abel SMITH was one of those men of calm, retired character who, in the very centre of the busiest capital in the world, and engaged in the most important transactions, pursued his tranquil way in performing good works.

Born in 1788, he early in life became possessed of ample fortune, bequeathed to him by an uncle; and after the death of his father, he became chief of the banking-house in Lombard Street, known as that of Smith, Payne, and Smith. He took great interest in all the scientific discoveries and inventions of late years, and carried out his views of the importance of education by promoting the improvement of the poor. Opulence never affected the simplicity of his character and habits. Careful and discriminating in all his transactions, and weighing with much consideration the claims made upon him, he was princely in his charities and also in his acts of pecuniary generosity. Appeals were seldom made to him in vain; both his sense of duty and the gratification of a most benevolent disposition leading him to give bountifully in cases of real distress and difficulty.

Mr. Abel Smith entered Parliament in 1809 and continued until 1846, during the last fourteen years of which he was returned for the county of Herts.

Richard Holmes LAURIE, the well-known publisher of nautical works, was born in 1777. From the year 1818 he relinquished all other collateral branches of publication, and contented himself with maintaining the character of his nautical works for excellence and minute accuracy. These works, unattractive, and not much known to the general public, have high claims to consideration from their wide-spread circulation and great general utility among geographers. Mr. Laurie was very highly respected for his strict integrity. He was one of the oldest members of the trade, and almost the last connecting link between the old and new systems of publication.*

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* In addition to the above the Society has to regret the loss of the following Fellows, viz.:—Alexander Cumming, M.D.; H. Stewart Dykes; Sir Isaac L. (Baron) Goldsmid, Bart. (whose liberal support of science and letters was widely felt); the Rev. J. W. Martin, LL.B.; James Morison; Aristides Franklin Mornay; and Thomas Lister Parker.

William Kennett LOFTUS, who, though not a Fellow of this Society, had contributed some important papers to its Journal,* comprising Notes of a Journey from Busrah to Bagdad, and on the Determination of the River Eulæus of the Greek Historians, died in November last, at the age of thirty-seven, on board the *Tyburnia*, on his way home from India. Mr. Loftus was a good scholar, and had passed much of his life in the East. He served four years in Mesopotamia under Colonel Williams (now Sir W. F. Williams of Kars), as naturalist and geologist to the expedition sent out for the settlement of the Persian frontiers. On his term of service expiring, he was sent by the Assyrian Society to investigate the ruins of Babylon and other ancient Biblical cities. The results were published in a book entitled 'Travels and Researches in Chaldæa and Susiana,' which reflected much credit on this young geographer and archæologist. Afterwards appointed as a geological surveyor on the Great Survey of India, he laboured zealously at his work till he was struck down by a sun-stroke. He went to Rangoon to recruit his health, and not succeeding, was ordered home, and died on the voyage.

ADOLPHE SCHLAGINTWEIT.—In closing this obituary, it is my melancholy duty to state that the event which was foreshadowed in the Address of last year has been realized; and that the bold and accomplished explorer, Adolphe Schlagintweit, is no more!

The documents which attest that he was assassinated before the walls of Káshgar (midway between Yárkand and Kókan) were officially transmitted by Lord Stanley, the Secretary for India in Council, and laid before the Society.† It appears that Adolphe Schlagintweit, who took a route farther to the west than his brothers Hermann and Robert, had succeeded in penetrating farther than they did into Central Asia; for he not only reached Yárkand, where he was well received, but was on his route to Kókan, when, in one of those religious forays made by the fanatical Turks or Crescentaders from Kókan against the Chinese, he was killed in August, 1857, by order of a savage Mohammedan chief, named Wulli Khan.

When we know that the deceased had overcome the greatest difficulties of his perilous journey, had traversed the western prolongation of the Kara-Korum chain, and that northernmost ridge of those vast mountains which his brothers consider to be the Kuen Lun of Humboldt, it is deeply to be deplored that the great amount of knowledge he had accumulated should thus have been lost.

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* *See* vols. xxvi. and xxvii.

† These papers have since been printed by his brothers Hermann and Robert *for* private distribution.

Although it is known that the adventurous Conolly did, when at Bokhara, penetrate from that place to Kókan, no European of modern times has succeeded in passing from India over the snowy chains of the Kara-Korum and Kuen Lun, to descend into Turkistan, except the Schlagintweits; and it is most distressing to have to record that he of the three brothers who pushed his adventure the farthest should have been cut off at a time when his note-books and observations must have been of the highest value.

As Englishmen, we have, however, the consolation of reflecting, that our authorities who gave the warmest support to the deceased traveller whilst in life, have never ceased to endeavour to trace the history of his last days, and are even now energetically endeavouring to recover his lost papers.

No individual has taken a more lively interest in these last-mentioned researches than our distinguished associate, Captain Richard Strachey, who, with his brother, one of our medallists, is so well known to us by his explorations in the Himálayan Mountains and Thibet. Seeing what has also been done by Lord W. Hay, Colonel Edwardes, and Mr. Knox, as well as by the Russian Consul at Chúquchak, M. Vardouguine, we may rest assured that every effort will be still made to recover the lost records of the zealous and intrepid Adolphe Schlagintweit.

GEOGRAPHICAL PROGRESS IN THE PAST YEAR.

In proceeding, as on former occasions, to bring before you a review of the progress of geography during the past year, I must claim your indulgence when I say that, from my numerous avocations, I have found it impossible to prepare a more complete retrospect than that which I now offer.

In truth, the field of exploration and discovery is becoming too vast to permit any one man—however zealous and laborious—to accomplish such a task without many omissions; to say nothing of the difficulty of condensing into one Report the merest outline of all the geographical literature of the year.

The account of the progress of the British Admiralty Surveys, which—as usual—is first given, is indeed as perfect as at any former period; for, in continuation of the practice of Admiral Sir F. Beaufort, his revered predecessor, Captain Washington, the hydrographer, has prepared this document with his well-known and acknowledged skill.

Let us, therefore, begin with this National Maritime Survey, after the reading of which I will endeavour to pass in review the most important geographical discoveries in various parts of the globe, as well as to note the progress of publication in various countries.

ADMIRALTY SURVEYS.

The Coast surveys in course of execution under the orders of the Admiralty, both at home and abroad, have made fair progress during the past year. They are conducted by twenty different surveying parties—one half of which are employed on portions of the coasts of the United Kingdom, the remainder in the colonies of Australia, Cape of Good Hope, West Indies, Nova Scotia, Canada, and British Columbia; also in the Mediterranean, in Banca Strait, and on the coasts of China and Japan.

England.—On the east coast of England, the only work of importance has been the re-examination of Hartlepool bay by Captain Bedford and Lieutenant Horner, with a special view to discover if any silting up had taken place since the first detailed survey of the bay was made by Commander Slater in the year 1829, and repeated by Mr. E. K. Calver in 1843. The new plan is drawn on a scale of eight inches to the nautic mile, and is sufficiently minute to have enabled Captain Bedford to furnish the Refuge Harbours Commission (at whose instance the survey was made) with a decided opinion, or rather proof, that no perceptible change had taken place in the depths within the last thirty years. Fortified by this result, the Commissioners have recommended Hartlepool bay as one of the sites for a refuge harbour on the east coast of England.

On the south coast, Commander Cox and Messrs. Usborne and Davis are continuing the survey of Hamoaze, and have completed St. John Lake and St. Germans River, including 33 miles of river bank line and 13 square miles of soundings. In the Channel Islands, Commander Sidney has re-examined the harbour of Braye, in Alderney, and the Great Bank off Guernsey. A valuable addition to the navigation of the Channel has been made in the publication by the Admiralty of the 2nd volume of the 'Channel Pilot,' containing Sailing Directions for the north coast of France, from Dunkirk on the east to Ushant on the west, comprising the Channel Islands. The work has been carefully compiled by Mr. J. W. King, of the Hydrographic Office, from the 'Pilote Français,' the labours of Rear-Admiral Martin White, Mr. C. Burney, R.N., and others.

In Cornwall, Captain Williams and Mr. Wells have surveyed eight miles of open coast from the Rame Head westward to St. Germans beacon, including Whitesand bay and Port Wrinkle, sounding over an area of 230 square miles between the Beacon and Falmouth, with plans of the small harbours of Boscastle and Port Isaac, on the north coast of the county; they have also executed a very detailed plan, on the scale of 100 feet to an inch, of the Eddystone rocks off Plymouth, showing the exact outline of the granite mass that forms the base for that wonderful structure, the Eddystone Lighthouse, erected by Smeaton in 1760, and which has hitherto withstood the force of the Atlantic waves. A similar structure, in a still more exposed situation, has just been completed, under the direction of the Trinity Board, by their skilful engineer, Mr. James Walker, ably seconded by Mr. Douglas, on the Bishop rock, six miles south-west of the Scilly Isles. These noble light-towers, like the two similar buildings on the Bell rock on the east coast of Scotland, and of Skerryvore on the west, are national works in the cause of humanity, and for the safety of our shipping, of which the country may be justly proud; and they will transmit to distant posterity the names of the eminent engineers Smeaton, Walker, and the Stevensons, father and sons.

In the Bristol Channel and its approaches, Commander Alldridge and Mr. Hall, in the *Asp*, have made a survey of Swansea Bay and its immediate neighbourhood, which has revealed some patches of hard ground—probably oyster beds, not before known. This plan, which shows sixteen miles of coast line and 20,000 casts of the lead, is drawn on the scale of nine inches to a statute mile, and proved very useful to the Refuge Harbours Commission in its examination of Swansea Bay and the Mumbles, which had been mentioned as a site for a refuge harbour; and, although the Commission has not recommended it as such, there seems a fair probability that the shelter afforded by the Mumbles Head, the abundance of stone for construction, and the increasing want of some shelter for the rich copper ore ships, which are frequently obliged to ride out southwesterly gales in this exposed roadstead, will lead the enterprising merchants of Swansea to consider whether, notwithstanding their recent spirited outlay on docks, they cannot construct a sufficient breakwater out of their own resources. The requirements of the Harbours Commission have also led to the publication of a chart of Lundy Isle, on the scale of 4¼ inches to a mile, and of the two sheets of the upper portion of the Bristol Channel, on the scale of two inches to a mile, which are rapidly advancing to completion.

Scotland.—In Argyleshire, Commanders Bedford, F.R.G.S., and Creyke, and Mr. Bourchier, R.N., have been employed on the coasts of Mull, and an useful Chart of the Sound of Iona from their survey has been published on the scale of 3 inches to a mile. In this immediate neighbourhood the geographical features of the country have suffered some change from the breaking down of the reservoirs of the Crinan Canal, caused by the heavy rains. In restoring this navigation, we may express a hope that the dimensions of the locks of this canal will be placed more on a par with those of the Caledonian Canal, so that the greater part of the vessels that navigate the one should also be enabled to pass through the other; seven out of the fifteen locks might also be dispensed with, and an uninterrupted level be carried from the top of the rise near Loch Gilp Head on Loch Fyne, to the descent into Loch Crinan on the north. This event, too, has again opened the question of the Argyle Canal, to connect by a short link of about one mile East and West Tarbert lochs.

In Skye, Commander Wood and Mr. Forbes have surveyed twelve miles of the open coast on the south-west face of the island from Loch Bhreatal northwards to Loch Bracadale, including the smaller inlets known by the names of Lochs Eynort and Harport, and the district of Minginish, with its magnificent mural cliffs, rising 800 feet almost precipitously from the sea. On the coast of Inverness-shire, Mr. Jeffery has completed the shore line and outlying rocks and soundings as far south as Ru Arisaig.

In the Hebrides, Captain Otter, in H.M.S. *Porcupine*, with her tender the *Seagull*, Lieutenant Chimmo, aided by his staff of Lieutenants Dent and Hawes, and Messrs. Stanley and Cramer,* has surveyed Loch Roag on the west side of Lewis, and made a beginning on Loch Maddy on the east shore of North Uist; he has also examined the dangerous rocks the Haskier, seven miles to the westward of that island, an outlying group, on which it is proposed to place a light for the safer navigation of those seas, and to lead up to the northern entrance of the Sound of Harris. In connection with the Skye survey, the *Seagull* was employed in sounding over an area of several square miles between the south of the island and the detached islets of Canora, Rum, and Eig. In the island of Harris, Lieutenant Thomas has surveyed West Loch Tarbert, and connected it with the eastern loch, which he completed last season. All these plans are projected on the scale of six inches to a mile. Some of the original drawings have been exhibited at our evening meetings, and have justly elicited much admiration.*

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* It is with extreme regret that I mention that the preparing and colouring the sheets containing the survey of Loch Roag was Mr. Cramer's last work: over-anxiety on account of domestic illness, with the rigorous climate of the Hebrides, brought on an attack of disease from which he could not rally, and at the early age of thirty-five an accomplished artist and an honest, hard-working man was lost to his country.

Some of the results of these and former surveys of the west coast of Scotland have been published by the Admiralty since our last Anniversary; among others I may mention charts of Lochs Torridon and Shieldag, and of Lochs Carron and Kishorn on the west coast of Ross-shire, both engraved on the scale of three inches to a mile; Loch Tuath and the isles on four inches; and the sound of Harris on a scale of rather less than two inches to a mile, but sufficiently large for all the requirements of the mariner. Besides these, there is a general chart of the coast from the Mull of Kantyre to Cape Wrath, on the scale of a quarter of an inch to a mile, which for the first time represents with tolerable accuracy the western shore of Scotland with its numerous islands. The intricacy of this coast has hardly its parallel on the globe, unless it be some portions of the west coast of Norway, Tierra del Fuego, and the west coast of Patagonia. It has occupied more than twenty years to survey; and, with the off-shore soundings, will require five years more to complete it. Its cost when finished will not have been less than 250,000*l.*

Ireland.—On the east coast of Ireland Messrs. Hoskyn, Aird, and Yule have surveyed Dundalk bay and harbour, and broken ground at the Strangford narrows. In the course of their work they have sounded over an area of 70 miles; but the chief service rendered by this party of surveyors is the boring of Carlingford Bar, preparatory to rendering that fine lough a harbour of refuge. It is gratifying to know that the result of their examination proves that there is no obstacle that may not be easily overcome, and that there is a fair probability that within three years we shall see a refuge harbour in this portion of the Irish Sea, where it is so much needed.

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* Lieutenants Thomas and Chimmo have made a series of meteorological observations during the past season in the Hebrides, which are very creditable to those officers, and will, no doubt, prove valuable to meteorologists.

In Donegal, on the north coast, Captain Bedford and Lieut. Horner have completed that portion of the shore which was required to fill up the gap in our charts; all that now remains is to carry the soundings off shore to a depth of 100 fathoms. In addition to his usual labours, Captain Bedford, at the request of the Refuge Harbours Commission, prepared a report on the want of lights and buoys on the north-west coast of Ireland, from Galway round to Londonderry, a valuable document, being the result of his 20 years' experience, which is printed in the Appendix to the Report of that Commission.

In Kerry, on the south-west coast, Commander Edye, with Messrs. Macdougall and W. B. Calver, have been employed on the Blasket Isles round from Dingle Bay to the Skerries, in the course of which they have sounded over an area of several square miles. This completes the survey of the shores of Ireland; it only remains to carry the soundings off shore to the depth of 100 fathoms.

In the course of the past year the charts published of the coast of Ireland are Dunmanus Bay in Cork on the scale of 3 inches, Loughs Swilly and Foyle and the river and harbour of Londonderry on the scale of 1½ inches to a mile, the latter showing the new quays, and the admirable lighting and beaconing of the river and lough, which have been carried out by the enterprise of the Harbour Commissioners of Derry, seconded by the skill of their engineers the Messrs. D. and T. Stevenson of Edinburgh.

Mediterranean.—The channel between Malta and Gozo has been re-examined by Captain Spratt, F.R.G.S., and Lieut. Wilkinson, in H.M.S. *Medina*, and a second Report has been written by the former, showing how the Nile continues to bring down its deposits, and how the advance of the delta is checked by the littoral drift from the west; a subject on which I shall dwell in the sequel. Captain Spratt has also presented to the Society a dissertation on the site of Pelusium, which he does not believe to have been at the ruins of Tineh as has been generally supposed, but at some place rather farther inland.

Lieut. Wilkinson, under the direction of Captain Spratt, has made a general chart, showing at one view his surveys of the delta of the

Danube in the Black Sea, to which I referred last year, forming a beautiful drawing, which has been exhibited at one of our evening meetings, and justly elicited warm commendation.

On the coast of Syria Commander Mansell, with his assistants Lieut. Brooker and Mr. Frederick Skead, have surveyed the gulf of Iskanderún, and made plans of the roadsteads of Ayas on the north and Alexandretta on the south. They will now proceed systematically to the southward along the coast by Beirút, Akkah, and Yaffa, and so join their former survey of the coast of Egypt at El Arish.

South Africa.—In the Cape Colony Mr. Francis Skead has completed the survey of Table Bay, which has been published by the Admiralty. He also accompanied Dr. Livingstone to the mouth of the Zambesi, and has made a sketch survey of the delta of that river, as far up as Expedition Island. It is gratifying to be enabled to report that, thanks to the energy of Rear-Admiral the Hon. Sir Fred. W. Grey, and the ready aid of Mr. Maclear, Astronomer at the Cape, a transit clock and a time signal ball have been erected in Simons Bay, and that henceforward vessels will be able to rate their chronometers in Simons as well as Table Bay, in each of which the time signal ball drops at the instant of one o'clock Cape mean time, to which I shall have occasion to revert a little farther on.

Red Sea.—Captain Pullen, in H.M.S. *Cyclops*, has completed a line of soundings in the Red Sea, to which I referred last year, and it proves that the greatest depth does not exceed 1050 fathoms: he has also carried a line of soundings from Aden to Kurráchi, in which the general depth at 12 miles off shore is about 500 fathoms, and the deepest 2000 fathoms in crossing the entrance to the Persian Gulf. Not improbably at the moment I am speaking, the submarine telegraph cable has been laid down that will unite England viâ Constantinople with Aden.

In Ceylon a new survey of the harbour of Point de Galle, by Mr. J. Power Royston, has been just published by the Admiralty on the scale of 15 inches to a mile; it is, we believe, preparatory to the erection of a breakwater in that much frequented but exposed bay. Mr. Stanton, who has succeeded Mr. Richards in command of the *Saracen*, with his assistant Mr. Reed, is employed in the survey of Banca Strait and its immediate neighbourhood which forms the highway to China, and is still but imperfectly known.

China.—Commander Ward, who has succeeded the late lamented

Captain Bate in command of the *Actæon*, with her tender the *Dove*, Lieut. Bullock, and his staff of surveyors, Messrs. Kerr and Blackney, has greatly improved the chart of the Chu Kiang, or Canton river, and Lieut. Bullock has recently explored the western river for about 150 miles. In the Yang-tse-keang the surveyors accompanied Lord Elgin in his exploratory voyage by Nankin to Han-Kow, and availed themselves of the opportunity to make a good eye sketch of the river for 150 miles as far as the city of Han-Kow, an account of which the Society has received from Captain Sherard Osborn, and on which I shall dilate in the sequel. Captain Ward and his staff have also re-surveyed the river from Wusung to Shanghae, which will shortly be published. In the Gulf of Pechili the Pei-ho has been ascended as far as Tien-sin, and a survey, made by Monsieur E. Ploix, ingénieur-hydrographe of the French navy, has been published by the Admiralty in two sheets, on the scale of about 2½ inches to a mile.

Japan.—Some additions to the United States' Survey of Yedo bay have been made by Captain Sherard Osborn and Commander Ward, and plans of this bay, of Simoda and of Hakodadi, have been published by the Admiralty.

Australia.—Captain Denham, with Lieutenant Hutchison and the officers of H.M.S. *Herald*, have made a partial survey of Shark Bay on the west coast; they have also sounded the approaches to Port Jackson, carried a track through the Coral Sea, correcting the sites of the Cato and other banks, and discovered a dangerous rock at the entrance to Moreton Bay. The plan of Port Jackson, completed last year, has been published, on the scale of 3½ inches to a mile, also the 2nd volume of the Australian Directory, compiled by Commander C. B. Yule, comprising the east coast and Torres Strait, a valuable boon to the mariner. Captain Sir Edward Belcher has re-examined all the longitudes in the Eastern Archipelago, from Madras eastward, and has endeavoured to reconcile the discrepancies which exist, not, however, such as to affect navigation, but far too great for the present state of hydrography in other parts of the globe.

Indian Survey.—The transfer of the government of India from the East India Company to the Crown, and the opening up of a trade to China and Japan, seems to be an occasion calling for a more extended notice than usual of the state of the surveys in the East, which have been made by the officers of the Indian Navy. Whether these surveys will remain under the present direction, or be placed more immediately under the Crown, is unknown to me; but I am satisfied that I shall render good service by placing on record the present state of the coast survey in the East Indies and China; at the same time expressing our thankfulness as geographers for what the East India Company has already done. It is proposed to extend this brief notice from Suez in the West throughout India, China, and the Asiatic Archipelago, to New Guinea and New Zealand in the East.

The Red Sea, Gulf of Aden, Socotra, and the south-east coast of Arabia, have been sufficiently surveyed for the purposes of navigation by the officers of the Indian Navy, as also the coasts of Beluchistán, Scinde, and Kattiwar, as far south as Cambay. The Gulf of Persia, however, requires some re-examination, which, it is understood, is in progress.

From Cambay southward, along the entire coast of Malabar to Cape Comorin, and thence northward by Madras to Calcutta, the whole of the peninsula of India has been triangulated. The nautical survey of the west coast, and of the east coast between Madras and Santipilly, have also been completed. From the Gulf of Manaar northward to Madras, and from Santipilly to Point Palmyra, is in course of progress by the officers of the Indian Navy. The Sunderbunds, or mouths of the Ganges, up to Calcutta and to Chittagong, have been completely surveyed.

In Ceylon the west coast is also surveyed, but the south and east coasts only very partially, and require early attention, especially in the neighbourhood of the dangerous rocks—the Basses—off the south-east side of the island. The plans of Trincomalee and Point de Galle are passable; that of Colombo is still wanting. The Maldivas, Laccadivas, and Chagos Archipelago, have been carefully surveyed, and published on a large scale by the East India Company. The coast of Chittagong and Aracan, southward to Cape Negrais, has been partially surveyed, but requires further examination. The river up to Aracan, the Negrais up to Persaim, with its outlying dangers to Preparis, and the Rangoon River, have been sufficiently surveyed. The coasts of Martaban and Tenasserim, as far as St. Matthew Island, including the Mergui Archipelago, have been partially surveyed, but require more examination. From Isle St. Matthew southwards to within ten miles of Pulo Penang, the Malacca coast is all but unknown, though a survey is in progress. The same with the Andaman and Nicobar groups, of which we hardly know anything. Keeling Island has been completely surveyed. The eastern shore of the Strait of Malacca as far as Singapore, and that harbour, have been well surveyed, the latter by Mr. J. Richards, R.N. The western shore of the strait has been very loosely examined. The straits of Durian and Rhio have been partially surveyed, but are very incomplete. The same with the straits of Banca, Gaspar, Macclesfield, and Stolze, the Carimata channel, the west coast of Sumatra, and the islands of Banca and Billiton. The strait of Sunda is fairly known, but not completely surveyed. The island of Java, with the outlying islets and the whole of the Java Sea, have been partially examined by the Dutch, but are still very far from being complete. The same with the islands to the eastward; as Baly, Lombok, Sumbawa, Sumba, Flores, and Timor.

The east, south, and west coasts of Borneo, with the exception of a few spots, as Pantai and Bulúngan rivers, Cape Kani-úngan, and Sambar Point, are quite unknown. The north-west coast, from Tanjong Api by Saráwak and Labúan to Balambangan, is sufficiently surveyed. Of the Natunas north group little is known; the south group has been surveyed, and connected with the coast of Borneo. Of the Anambas and Tambelan groups, and of the isles just to the eastward of Singapore strait, we are quite ignorant; with the islands and dangers south-east of Singapore, as Bintang, Battam, Linga, Sinkep, &c., we are better acquainted, although our knowledge of them is still very defective. The east coast of the Malay peninsula from Singapore northwards has been passably surveyed. The Gulf of Siam has been better surveyed by Mr. John Richards, R.N., but some detached portions on the west coast still require examination, and new soundings are wanted all over the gulf.

On the south coast of Cambodia, from Pulo Obi to Cape Padaran, we know nothing. From Cape Padaran northwards, along the coast of Cochin China, has been partially explored, but requires more examination. Turon Bay is surveyed and published. The Gulf of Tong-kin is utterly unknown. The south-east coast of the island of Hainan has been partially explored, but not sufficiently. The rest of the island is unknown.

Pulo Condore, Pulo Sapata, with all the dangerous rocks and shoals in the southern part of the China Sea, across to the coasts of Borneo and Paláwan, require examination more urgently than any portion of these seas. Farther north the group of the Paracels and the Macclesfield Bank have been explored, but require more careful examination. The island of Paláwan has been completely surveyed, and the charts published. A map of Luzon exists, but no coast-survey, with the exception of the port of Manila, which is complete.

In China Proper the coast from Hainan Island to Macao has been partially surveyed. From Macao to Canton the river is fairly surveyed, but the group of islets to the south-west of Hong-kong, fronting the entrance of the Chu Kiang, requires further examination. From Hong-kong the east coast of China, as far as the entrance of the Yang-tse-keang, has been sufficiently surveyed for the general purposes of navigation, but as it is not a work in detail, vessels must use caution in approaching the different anchorages.

The Pescadores group and the Chusan isles are also surveyed, but of Tai-wan or Formosa the survey is very partial and detached. The Bashí and Balingtang channels, between Formosa and Luzon, have been explored, but are not at all sufficiently known, and especially the meridian distance is wanted between the Babuyan and the Bashí groups.

The Yang-tse-keang has been explored up to Nan-king, but is far from being properly surveyed; and, indeed, the shifting nature of some of the banks renders it very difficult to make a correct chart of it. From Nan-king upwards to Han-Kow is only known from the track of the expedition in November, 1858.

From the Yang-tse-keang northwards by the Hwang-ho, or Yellow River, as far as the Shantung promontory, being the eastern extreme of that province, the coast has not even been explored, if ever seen, by any European navigator. The Gulf of Pechili is a little better known, especially about the mouth of the Pei-ho. That river is also laid down as far up as Tien-sin; thence to Pekin is only known from the embassies of Macartney and Amherst. The Gulf of Leao-tong is almost unknown. So also with the western coast of Korea, except a few detached capes, the position of which has been fairly determined.

The island of Quelpaert and Port Hamilton have been surveyed. The east coast of Korea has been explored by the French and Russians, as also the coast of Manchuria, as far northwards as the mouth of the Amúr. In this extent Victoria Bay, Port Michael-Seymour, Barracouta Harbour, and Castries Bay, are the only spots passably surveyed.

The Gulf of Tartary also has only been explored. Pérouse Strait, between the south end of Saghalien and Yezo, has not been examined. Of Yezo Island in Japan nothing accurate is known, except the south-west extreme, which forms the northern limit of the Strait of Tsugar. This latter strait, including the north side of Niphon, has been surveyed. Of the rest of Niphon, with Kin-sin and Sikok, we know nothing, except the position of a few points at its western extreme. There are, however, fair surveys of the bays of Naga-saki, Simoda, and Yedo. Of the islets of Fatchin and Tsu-sima in the Strait of Korea, and of Argonaut and Dugelet islets, we know nothing accurate.

The Kuril Islands, Kamchatka, and the Sea of Okhotsk, have been explored by the French and Russians; the harbour of Petropavlovski has been completely surveyed by the English. Proceeding southward from Japan, the Linschoten Islands are very imperfectly known. The Loo-choo group has been better explored, but still is very incomplete. The Meiaco-sima group has been surveyed.

The Philippine Islands, including Luzon, Mindoro, and Mindañao, have been explored by the Spaniards, but are not surveyed; it is understood that a survey, which is much wanted, is in progress. The same may be said of the Celebes Sea, and of the east coast of Borneo, and west coast of Celebes Island, forming the Strait of Macassar, which is also unsurveyed. Of the Island of Celebes little is known except the western part of the Gulf of Boni, which has been surveyed by the Dutch, and Macassar roadstead by the English. Of the Flores Sea, Banda Sea, Arafura Sea, and the group of islands forming the eastern passages to China, although greatly frequented by shipping, no survey exists.

Of the north-western side of Papua or New Guinea nothing accurate is known. On the north side there is a track-survey, and a few points are fixed, otherwise it is unexplored. The same may be said of the group of the Solomon Islands. The south coast of New Guinea, from the Louisiade Islands westward to Torres Strait, has been surveyed by the English; so also has been Torres Strait.

In Australia, the eastern coast from Torres Strait southward to Halifax Bay, in lat. 19½° South, has been well surveyed; the remainder to Bass Strait has been only partially examined, but some of the harbours, as Port Bowen, Port Curtis, Sandy Island Sound, Moreton Bay, Port Macquarie, Newcastle, Port Jackson, and Twofold Bay, have been completely surveyed. The Coral Sea to the eastward of Australia, a very frequented track between Sydney and China, has been partially explored, but urgently requires a more complete examination.

Bass Strait has been partly, but not sufficiently, surveyed. The east, south, and west coasts of Tasmania have never been surveyed, nor even the harbour of Hobarton. From Bass Strait westward to the Gulf of St. Vincent has only been explored. St. Vincent and Spencer Gulfs were partially surveyed by Flinders. From Spencer Gulf to Cape Leeuwin, the coast of the great Australian bight, there is only a track-exploration. King George Sound has been partially surveyed.

From Cape Leeuwin to Swan River is only explored. Swan River has been surveyed; thence to Shark Bay, and round the north-west coast to Port Essington, has been sufficiently surveyed for the purposes of navigation, yet hardly, perhaps, enough to please geographers. The islets and shoals lying between Timor and the north-west coast of Australia require to be examined. Port Essington is completely surveyed. Thence to Cape York, including the Gulf of Carpentaria, the coast has been explored, and portions of it partially surveyed, but all of it requires further examination. It will thus be seen that there is ample employment in these eastern seas not only for three surveying vessels, but for double that number if we wish that hydrography should keep pace with the rapid advance of civilization and population.

America.—Crossing the Pacific Ocean to the north-western shores of America, we learn that Captain George H. Richards, with his staff of zealous assistants, Messrs. Bull, Pinder, Mayne, and Bedwell, has completed an admirable survey of Rosario and Haro Straits, and of the numerous islets that lie between the mainland and Vancouver Island, an extent of about 800 miles of coast line, sounding over an area of about 700 square miles—the largest amount of hydrographic work, we believe, ever accomplished in one season by a party of five surveyors. The general chart of these straits engraved on a scale of ½ an inch to a mile is on the eve of publication at the Admiralty. A sketch survey of the Frazer River, in British Columbia, showing the several gold reefs, by Lieut. Mayne, R.N., and Mr. Begbie, Colonial Judge, on the scale of 1 inch to a mile, has already appeared.

Nova Scotia.—On the east side of the North American continent, Commander Orlebar, with his assistants Commander Hancock and Messrs. Desbrisay, Clifton, and Carey, have surveyed 46 miles of the open coast of Cape Breton Island, from Cape Hinchinbroke to Port Nova, including Louisburg Harbour. Some plans also have been published of harbours on the coast of Nova Scotia, as Ship, Guysboro', and Beaver harbours, each on the scale of about 4 inches to a mile. In Newfoundland advantage was taken of the laying down the Atlantic submarine cable, to make a plan of Bull Arm, Trinity Bay, by Captain Otter and the officers of the *Porcupine*. In the Bay of Fundy Captain Shortland, with his staff, Messrs. Scott, Pike, Scarnell, and Mourilyan, have surveyed the coast of New Brunswick from St. Martin Head easterly to Wolf River, part of Chignecto Bay, and the Bay of Mines, sounding over an area of 400 square miles.

In the West Indies Mr. Parsons, with his assistants Messrs. Dillon and W. B. Calver, are engaged on the island of Grenada. The 2nd volume of a new edition of the 'West India Pilot,' compiled by Captain E. Barnett, has been published at the Admiralty, and is a great boon to the mariner. After bearing his part in the successful laying down of the Atlantic submarine cable, Commander Dayman on his passage home carried a line of soundings from the Azores to England, showing a depth of 2500 fathoms to within 60 miles of the edge of the 100 fathoms shelf which extends from the Land's End, thus indicating that a more sudden dip in the bed of the ocean exists here than was found to the westward of Valentia, in Ireland.

Variation Chart.—I had occasion to mention last year that a Variation Chart of the world, showing at a glance the curves of equal magnetic variation, was in preparation at the Admiralty by Mr. Fred. T. Evans, R.N., chief of the Compass Department. This chart has since been published; and judging from the testimony to its value borne from all quarters, it has proved even a more accurate and useful document than was anticipated. The whole of the curves are reduced to the epoch of 1858; the chart gives also the annual change of variation which is constantly in progress, and this in places exceeds seven minutes yearly. This may appear a small amount, but when we consider that in the greater part of the charts by which our merchant ships are navigated, the variation has not been corrected for thirty, forty, and even fifty years, the practical sailor will at once see a fearful source of error that may, unsuspected, exist. The error of a quarter of a point of the compass in a run of 500 miles would amount to 25 miles, and this, in navigating a long narrow sea or strait, as the Adriatic or Red Sea, might readily lead into dangers, and this error has doubtless been one of the many causes of shipwreck. By this chart the means of correcting the variation in all charts are now within the reach of every one for a few shillings, and we trust it will be largely circulated. It is gratifying to know that a strong expression of the approbation of the Lords Commissioners of the Admiralty has been officially communicated to Mr. Evans for the labour and scientific skill he has bestowed upon this beautiful and useful production.

Besides the surveys above enumerated as in progress in different parts of the world, the labours of the Hydrographic Office during the past year have consisted in the publication of upwards of 80 new and corrected charts of various coasts and plans of harbours. It may enable my hearers to form some idea of the activity that prevails in this department if I mention a fact just made known to me—that during this very month of May the large number of 20,000 Admiralty Charts have been printed and the greater part sold to the public. In addition to these works the usual annual lists of lights, of notices to mariners, of tide-tables, have been published; and lastly I may conclude this portion of my Address with an announcement which cannot but deeply interest all geographers, namely, that it has been determined that the Table of Maritime Positions, giving the latitude and longitude of 8000 places on the globe, compiled with great care by our late lamented Member HENRY RAPER, shall be annually corrected and kept on a par with the latest information at the Admiralty, as the best tribute that hydrography can offer to the memory of our deeply regretted friend and medallist.

LAND SURVEYS.

Ordnance Survey.—The reduction of plans on larger scales to the size of maps by means of photography has been brought into efficient public practice by Colonel James, the able Superintendent of the Ordnance Survey Office and Topographical Department, and a report of a committee, appointed by the Secretary of State for War, of which I was the Chairman, has entirely approved of the process.

When it is known that the largest of the British surveys as now sanctioned are on the scale of 25·344 inches to a mile, or the scale of one square inch to one acre, and that the expense of reducing that enormous scale down to six inch and one inch scales by means of any mechanical contrivance such as a pentagraph must be very considerable, the employment of photography to effect this purpose rapidly, accurately, and economically, reflects the highest credit on Colonel James.

A full and detailed account of the progress of the Ordnance Survey of the British Isles, and of the preparation of the plans and maps upon four different scales, will be found in the last Report presented to the Houses of Parliament. The account of the principal triangulation embodying the scientific results of the survey was published in the beginning of last year, and has been received with satisfaction by the scientific men of all countries.

Geological Survey of Great Britain.—Fully aware that the physical geography of a country can never be perfected until we are acquainted with the structure of the sub-soil, on which the outlines of the land depend, it is my duty to inform geographers of the progress which has been made in this branch of the Government surveys of which I am the director. In fact, the geographer has only to inspect the horizontal sections which we publish on the scale of six inches to a mile, to see how intimate is the connexion between geography and geology. Whilst coloured maps on the one inch scale have been published over a considerable portion of England, Wales, and Ireland, six sheets on a smaller scale have been issued, comprising all Wales and the bordering English counties. Lest any one should suppose that the production of this beautiful and compendious map had been favoured by myself because it includes the "Silurian Region," let me say that it was ordered by my predecessor, Sir Henry De la Beche, on account of the striking physical features of that region, and was far advanced towards completion when I took office.

Seeing the rapid progress which is made in England and Ireland, it is a subject of deep regret to me that two surveyors only are as yet allotted to Scotland. Knowing the extraordinary value of the great coal tract between the Firths of Clyde and Forth on the one hand, and on the other the great interest which geologists attach to the acquirement of true knowledge respecting the broken and mountainous parts of Scotland, it is manifest that the surveying force there ought to be much augmented; the more so as the Ordnance Survey, under the direction of Colonel James, is now issuing rapidly sheets on the six inch scale, relating to nearly the whole of the south of Scotland. The maps on this scale are of the greatest service to the field geologist, who registers upon them all his detailed data previously to a reduction for the one inch or published map. And although the six inch maps will not be published, copies of them will be registered in the public museum of Edinburgh ready to be consulted by all proprietors who seek for accurate details. I apprehend, indeed, that even when the one inch sheet, exhibiting the geological structure of the country around Edinburgh, is brought out (as will very shortly be the case), the public will be much struck with the value of maps in which every bed of coal is marked with precision; and I therefore trust that in the coming year the number of surveyors in Scotland will be so increased as to place that country on the footing of the English and Irish surveys.

Commencing their labours in the mountainous regions of the west of England and Wales, my coadjutors in England are now extending their works to the south-east; and seeing the great desirableness of completing as soon as possible the survey around the metropolis, I have brought about a concentration of work, which will ensure a speedy settlement of all questions respecting the subterranean drainage, sewerage, and water supply of this densely peopled tract.

Geological Survey of the West Indies.—Whilst the Government of the United States causes geological surveys to be made not only of their long settled territories, but also of tracts beginning only to be peopled, the mother country still proceeds on the old principle of never stirring till her colonists call out for scientific aid. Following the good example of their neighbours of the United States, our North American colonies of Canada appointed their own geologist, Sir William Logan, and every one versed in the sister science knows how well that able man is conducting the survey of that country. After this, the legislatures of India, the Cape of Good Hope, the Australian Colonies, and lastly, of Tasmania, have each asked for and obtained geological surveyors, most of whom had either been brought up in the establishment which I direct, or recommended by my predecessor or self: already geological maps and surveys of large portions of those countries have been constructed.

Two years ago the legislatures of the principal West India islands under British rule, requested the Government to send out geological surveyors, the half of whose expenses were to be borne by the colony explored, the other moiety by the Imperial Government.

The island of Trinidad was the first to be examined, and Mr. G. P. Wall, a distinguished pupil of the Government School of Mines, and Mr. Sawkins, were selected for that purpose. As their survey is completed, and has been placed in my hands for publication, I have no hesitation in saying that it is a work which will be of signal advantage to the inhabitants, and will be much approved by men of science.

Seeing that the only map of the island was very inaccurate, the geologists were compelled to survey topographically to some extent for themselves before they could prepare the map now in my possession, which is very creditably executed. Though it is out of place here to expatiate upon the succession of the various rocks and fossils of this great island, still the public will be glad to learn that these geologists discovered several beds of coal which, though of tertiary age, has been found to be of good quality and available for steam navigation; and as these strata crop out upon the shore, the discovery is one of considerable importance. The work will be illustrated not only by maps and sections, but also by a multitude of beautiful sketches of the country as prepared by Mr. Sawkins.

Geological Survey of India.—Professor Oldham, the superintendent of this survey, and formerly Local Director of the Geological Survey of Ireland, has lately issued a map of part of Central India, including the districts of Nerbudda and Saugor, which is important in a geographical as well as in a geological point of view; much of it being from original surveys made by the geologists. The memoirs of the survey, of which Part II. of Volume I. has just appeared in England, comprise matters also of importance to geographers. Such for instance is the description of the curiously flat-topped plateaux of the range of the Khasi Hills, forming long swelling grassy plains, marked here and there by small out-standing hillocks which scarcely interfere with the general level. These suggest the action of long continued denuding forces at tolerably fixed levels. Deep and narrow gorges or valleys form another peculiar feature in the Khasi Hills. In these the rivers in the northern portion find their courses to the plains, the level of the stream being 3000 feet below one of the hill stations.

Remarkable evidences are adduced of the power of water in translating huge masses of rock during great floods; and altogether the manner in which Professor Oldham has interspersed the description of physical and dynamical phenomena with his geological data must commend this memoir and the accompanying maps and sections to the attentive consideration of geographers.

PHYSICAL ENQUIRIES.

Progress of Meteorology.—Meteorological science, as resting on ascertained facts rather than on theoretical assumptions, has advanced steadily in this country, and also in France and other parts of Europe.

Volumes have also been widely circulated abounding in interesting speculative ideas, and conjectural explanations, which, so far as they contain a great deal of nautical information, have been extremely useful. But I am assured by my distinguished friend Admiral FitzRoy, now at the head of the Meteorological Survey of our country, that many of these works are not to be depended upon, and are not approved so cordially by the critical few as they have been by general readers.

In Europe, the works of Humboldt, Herschel, and Dové, grounded on sound induction, constitute, indeed, a safe basis on which the numerous class of observers may rest their meteorological facts, preparing, reducing, and classifying them, for the combination of master-hands. Thus, many extensive series of good observations, at sea as well as on land, have been made. Much is already garnered up; but the winnowing of the grain from the chaff, and the ultimate adaptation of the results, must be a work of time, labour, and ability.

At the observatories of Greenwich, Kew, and Oxford, photography has been brought to aid in the registration of all atmospherical changes. Self-registering anemometers have been used for some years successfully in England, and at the Cape of Good Hope. Such an instrument is on its way to Australia, and similar valuable machines, showing every variation of wind, recording accurately, and requiring attention only once in twenty-four hours, are already erected at Halifax and Bermuda by Her Majesty's Government.

Arrangements are made by the Board of Trade and by the Admiralty—in correspondence and co-operation with the various authorities around the seaboard of the Northern Atlantic—for collecting simultaneous observations, at least once a-day, all round our nearest ocean, and upon its surface, during one year—beginning this summer. By such an investigation, as devised by Admiral FitzRoy, a complete understanding and consequent explanation of the order, sequence, causes, and consequences of atmospherical changes and conditions over a large section of the world's surface may be gained in less time than, perhaps, by any other mode of operation. The effects of atmospherical phenomena on climate and on all waters, and even on tidal action (including currents affecting the configuration of land by abrasion or deposit)—these and the bearing of such phenomena on geological or ancient conditions of the earth are only appreciated by the comparatively few who have studied them.

The immense absorption or extrication of latent heat, the unknown amount of electrical action, as well as the chemical and mechanical combinations which occur during changes of weather (among which the presence or absence of ozone is an interesting subject of investigation); the formation and effects of ice, with the characteristics of ocean itself—are all phenomena that have been lately studied by meteorologists.

The number of meteorological observers and their dispersion over the world is now considerable. Besides Russia, Prussia, and Europe generally—India and Australia* have many well fitted stations—while the United States have spread them over a vast portion of the continent of America; a point to which I shall hereafter allude.

In Scotland, the instructive compilations of Mr. A. Keith Johnston have indoctrinated his countrymen with the desire to establish and keep up a well-ordered Meteorological Society, which is worthy of national encouragement. Following out this plan, Dr. Stark has produced a memoir, the result of two years' observations, on 'The Temperature of the Sea around the Coasts of Scotland.'† Whilst we must admit with this author, that the mild climate of Britain is, in great part, due to the prevalence of the south-westerly winds, I find that his opposition to the views of Commander Maury respecting the course and influence of the Gulf Stream is not accepted by some of our leaders in physical science.

Earthquakes and their Study (*or Seismology*).—In a work recently completed on the earthquakes of Switzerland, Dr. Volger has given a chronological account of all recorded earthquakes in that country from the year 562 to 1855. Illustrating his observations by an account of the geological structure of the Valais, he further describes in detail the shock of 1855, and lastly endeavours to explain the relations and causes of earthquake phenomena in general. Collating a quantity of curious data, this author attributes these paroxysms of the earth's surface in great measure to the changes and peculiar combinations of atmospheric and meteorological conditions. He combats the theory adopted by most geologists of a central heat, and also disallows the intimate connexion between volcanos and earthquakes; suggesting the falling of mountain masses into cavities, and the consequent production of shocks accompanied by much development of electricity. Not doubting that the records of Dr. Volger are faithful, and that they will afford materials for the elucidation of the phenomena of earthquakes, I must say, as a geologist, that I differ from his views, and adhere to the prevalent belief that the chief cause of all earthquakes is the effort of heat and gas to burst through the cerements composing the crust of the earth. I do so, because I every where trace the most intimate relations between earthquakes and volcanicity, both in those tracts where that force is at present in action, and in those where it has formerly shown signs of emission through fissures in the older rocks. On the other hand, the large regions like Russia in Europe which, as I have elsewhere shown,* have never been affected by eruptive rocks (or in other words where the crust of sedimentary matter has never been broken through in ancient periods), are just those countries in which earthquakes have been and are unknown.

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* *See* particularly the Third Meteorological Report, with a diagram, of Barometric Pressure (for the years 1857-8), prepared by Mr. R. Brough Smyth, the director of the Meteorological Observatories of Victoria, and presented to both Houses of Parliament.

† Read before the Royal Society of Edinburgh, 3rd January, 1859.

All those great movements of the earth's crust which have been so instrumental in producing and modifying from time to time the geographical features of our planet belong, I conceive, to the same class of phenomena as ordinary earthquakes, and are to be referred to similar causes acting with different degrees of intensity. Every great movement must, in fact, have been attended, towards the boundaries of the regions to which it extended, by those smaller movements, reduced for the most part to *vibrations*, to which the term *earthquake* has been usually restricted. Hence the theory of earthquakes can only be regarded as a subordinate part of any more general theory which may deal with all those movements, great or small, to which the superficial portion of the globe has been subjected, and which constitute, in fact, the basis of geological science. The smaller movements are those alone which man has had actual opportunities of observing, and hence the investigations of the phenomena attending them, and the causes to which they are assignable, have been separated from those of the allied phenomena somewhat more perhaps than some geologists might think desirable, and have been erected into a separate branch of science, under the name of *Seismology*. Dr. Young and Gay Lussac had suggested that earthquake shocks were propagated in a way analogous to the vibrations of sonorous bodies, but no attempt had been made to unite into a whole the mass of heterogeneous and other apparently conflicting facts, and account for them by the application of one consistent theory.

In February, 1846, Mr. Robert Mallet read to the Royal Irish

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* *See* 'Russia in Europe and the Ural Mountains,' chapters first and last.

Academy his Memoir on the Dynamics of Earthquakes,* in which his object was to show that all observed earthquake phenomena might be reduced to the direct motions (in accordance with the acknowledged laws of physics and mechanics) of three distinct classes of waves, all produced simultaneously by a single impulse, and originating at a single point, namely:—1st. The earth wave or shock through the elastic crust of the earth: 2nd. The sound waves through the same, or through the sea and through the atmosphere: 3rd. The great sea waves—or fluid wave of translation which rolls in shore after the shock—to which should be added the liquid wave, which he has denominated the "forced sea wave." He showed that the nature and sequence of the phenomena would differ as the centre of impulse was beneath the land or under the sea; and in the subsequent parts of his paper, illustrated by diagrams and maps, he indicated the bearings of his theory upon future research and its important connection with vulcanology and terrestrial physics, and thus laid the foundation for those methods of observation of earthquake phenomena which have since been very widely adopted. He pointed out the necessity for self-registering seismometers, and in the same volume of Transactions describes and figures the first completely self-registering seismometer proposed, whose functions were, by the aid of electro-chronographic arrangements, to determine the direction of motion, the moment of transit, and dimensions of the earth wave or shock. Mr. Mallet's views being founded on the admitted laws of exact science, and also distinguished by their simplicity, received the approbation of many competent judges throughout Europe.†

In 1850, at the request of the British Association, Mr. Mallet drew up a first Report upon the Facts of Earthquakes,‡ in which he discusses all anterior views, and with the guidance of his theory classifies and separates under distinct propositions the facts found scattered in multifarious confusion through earthquake narratives. He concludes by enunciating certain desiderata, amongst which were the formation and discussion of a complete catalogue of earthquakes for all time and all countries, and by submitting to the actual test of experiment the views which he had theoretically announced as to the elastic transit of the earth wave.

Funds were placed at his disposal for the purpose by the British

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* Trans. R. I. A., vol. xxi. p. 1.

† *See* Mrs. Somerville's 'Physical Geography,' Humboldt's 'Kosmos,' &c.

‡ Trans. Brit. Assoc. 1850.

Association, and by means of a new instrument (the seismoscope) and the creation of small but real earthquakes at pleasure by mines of gunpowder fired galvanically at the distance of a mile, he was enabled to ascertain the actual relative rate of transit of the earth wave or shock in loose sand, in shattered as well as in solid unbroken granite;* it being thus determined that an earthquake cannot move slower than in sand, nor probably faster in any known rock than in granite. These experiments Mr. Mallet, with the joint aid of the British Association and of the Royal Society, has since extended to some stratified rocks. Mr. Mallet has also condensed his views into the form of instructions for earthquake observation in the Admiralty Manual, and the Article has been translated into French by Mons. Perrey, at the desire of his Government.

The laborious compilation of the vast catalogue, comprising between six and seven thousand earthquake narratives, thus early projected, had been steadily pursued by Mr. Mallet, ably assisted by his eldest son, Dr. John William Mallet, of the University of Alabama, U.S., from 1852 to 1858, and last year the 'British Association Earthquake Catalogue,' by these authors, appeared in print, with the most complete discussion by curves and seismic maps ever made, and giving, so far as human knowledge goes, the facts of seismic distribution in time and in space.† Several deductions of interest and importance have resulted from this extensive labour, the most important of which is probably the now ascertained fact, that mere farther cataloguing is useless as regards the advance of science; since Mr. Mallet considers that no great generalization can be thus elicited. Looking to the true direction in which the efforts of seismologists are to operate, he recommends observation at self-registering seismometrical establishments at suitable localities in certain earthquake regions. The latter portion of his final Report is devoted to the description of the various forms of seismometers proposed by divers authors, and he has figured the preferable forms of seismometric apparatus to be adopted, which have resulted from the labours and experimental investigations of several years. The electro-seismic trigon, as his arrangement may be called, as well as the various simpler and ruder methods of approximate observation pointed out to the traveller in the Admiralty

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* Second Report, Trans. Brit. Assoc. 1851.

† Mr. Mallet and his son acknowledge the important lightening of their labours by the previous large and valuable catalogues of Von Hoff, and especially of Professor Perrey of Dijon, to whose collaboration in the seismic field they give the highest praise. (*See Mém. Acad. Roy. de Belgique, tom. vii., in oct.*)

Manual, should be known to every geographer who devotes a portion of his time to observations on terrestrial physics.

Lastly, Mr. Mallet under great privations re-explored, almost immediately after the recent occurrence of the great earthquake, the provinces of the kingdom of Naples, nearly from Bari to Calabria, and has collected many striking particulars, including great topographical changes of the surface, an account of which will be laid before the Royal Society of London, at the desire of which learned body he made his journey, and I look forward with deep interest to the publication of his results.

NEW PUBLICATIONS, MAPS, SURVEYS, ETC.

The 'Manual of Geographical Science' (Parker and Son), the first part of which appeared in 1852, having been completed this year by the addition of a well digested volume, can now be recommended to the public as a most useful and instructive work. The first portion embraced mathematical geography, physical geography, cartography, and geographical terminology. The new volume contains a learned and interesting history of ancient or comparative geography, by the Rev. W. L. Bevan; whilst the last 400 pages of the book, which are written by our indefatigable associate the Rev. C. G. Nicolay, are devoted to the progress of maritime discovery, and a description of the surface of the earth as now known to us. The lucid manner in which this author explains the relations of land and water, as well as all the leading physical outlines and waterpartings of continents, must have a most beneficial influence in impressing upon students the elements and principles of geographical science.

Among the communications to our Society I was much gratified to find the eminent astronomer, Sir John Herschel, coming before us in the last session with a new and ingenious projection of the sphere. The author shows that his projection offers several peculiar advantages for geographical purposes, particularly when the whole, or at least the whole accessible part of the globe, has to be mapped down on one sheet.

The astronomical experiment on the Peak of Teneriffe, which was carried out in 1856, under the sanction of the Admiralty, by Professor C. Piazzi Smyth,[*] is chiefly of interest to this Society from the observations of the Astronomer Royal of Scotland on the optical, atmospheric, astronomical, and physical phenomena, made at great altitudes on this volcanic mountain. We have particularly to thank him for his topographical descriptions, and for producing a striking relief map taken from a model prepared by Mr. Nasmyth, after determinations of the author, which reminds us of maps of the surface of the moon.

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[*] Parts of this work were published in the 'Philosophical Transactions;' but the whole work, as now brought out by the Admiralty, 1858, contains three additional

The works produced during the past year by our excellent cartographer, Arrowsmith, are :—1st, A Map of the Provinces of British Columbia and Vancouver Island, with Portions of the United States and Hudson Bay Territories, compiled from original documents, showing also the various Passes across the Rocky Mountains; 2ndly, a Map, in eight sheets, of the Island of Ceylon, constructed from a base of Triangulations and corresponding Astronomical Observations, during his employment on the staff of the colony, by Major-General John Fraser, late Deputy Quartermaster-General, reconstructed, incorporating a great number of original documents, and connected with the Great Survey of India; 3rdly, a Map of the Eastern Half of Australia, constructed from official and other original documents, adjusted to the Maritime Surveys of Flinders, King, Wickham, Stokes, Blackwood, Stanley, &c. This map, which is on six sheets, will show the route of many Australian travellers.

Mr. Arrowsmith is also about to publish other Maps, including a Map of the World, on two sheets, showing by repetition the connection between England and the Australian Colonies, both by the Cape of Good Hope and Cape Horn.

Having called your attention in days gone by to the improvements made in cartography by Mr. A. Keith Johnston, and to his zealous and successful endeavours to lay before his countrymen, on maps, all the chief data of physical science, I have now the satisfaction of adverting to his last important work—a new General Atlas. Fifteen years having elapsed since he published his National Atlas, the author felt that the time was come for the production of an entirely new work, which should embrace all the recent discoveries and all the territorial changes. In accomplishing this task, Mr. Johnston has succeeded in placing before the public a series of sheets of each region on a very convenient scale, and

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chapters—Geology and General Topography, Botany, and Miscellaneous Observations, including the author's ingenious method of eliminating the angular motions of a ship at sea, to which I alluded last year.

by a judicious selection of names, arranged on a special index accompanying each map, he at once directs the observer to the position of any place through the medium of letters of reference. But that which most pleases the eye and instructs the looker on is the remarkable distinctness which is given to every water-course, lake, canal, or railroad by the use of "light blue ink." By this process the orography and skeleton of each country stand out in clear relief, the coast-lines never confusing the student. In short, this atlas, of which two parts out of ten are now issued, will, I have no doubt, be generally approved, and its sale will, I trust, reward the author for his long and arduous labours.

Nelson's Atlas, of which one portion has been published, is an excellent and carefully executed work, of that class which reflects so much credit on our Scottish geographers, and is an evidence of the great and increasing interest taken by the general public in geography. This atlas gives the distances and measurements in English miles, a mode better adapted for length and area than for angular measurements, and which is to be elucidated by an index which will give the distance of each place from London in English miles. By consulting this index the position of any place on the map can be at once found, whilst its geographical position on the globe is told off in the language of common life. As I am informed that the calculations for the index involved several months of labour, I hope that the efforts of the publisher may be recompensed by a good sale.

I must also call attention to the '*Weekly Dispatch* Atlas,' comprising a series of excellent maps (issued one every week) with that paper. These maps include the English counties, as well as general maps,—some of them on a very large scale (India, for instance, being in 8 sheets). The maps are compiled from the latest authorities, and chiefly by Fellows of this Society, including Mr. Weller, Mr. Lowry, Mr. Dower, &c. The atlas will contain about 250 maps, of which 90 are already published.

Owing to the changes that have taken place since the 'Gazetteer of the World,' by Fullarton and Co. of Edinburgh, was first issued, a new edition of the first volume of that work, bringing up the geographical and statistical information to the present period, is in course of publication. The 'Royal Illustrated Atlas,' by the same publishers, and to which allusion was made in my Address of last year, has been continued, and will, it is said, be completed during the present year.

The 'Imperial Atlas,' by Blackie and Son, the compilers and publishers of the 'Imperial Gazetteer,' is now finished, and consists of 31 parts, containing 78 beautifully engraved sheets, and comprising upwards of 100 useful maps. An index to the work is, I understand, in course of preparation.

CONTINENT OF EUROPE.

Germany.—Among the larger cartographic works published by the establishment of Justus Perthes at Gotha, which are now attracting particular attention, is Mayr's Atlas of the Alpine Countries. Three sheets have appeared, and the remainder will, it is said, be completed this year. It is on the scale of $\frac{1}{\text{[illegible]}}$, consists of nine sheets, and extends from the valley of the Rhone on the west to Vienna on the east, from Strasburg on the north to Nice, Leghorn, and Ancona on the south; thus comprising the seat of the present war. No map of this extensive region has been published on so large a scale. Of the usefulness of this work a proof has recently been given by the fact, that 45,000 copies of the part which refers to the seat of war were, I am told, recently sold in a fortnight.

A condensed edition of Dr. Barth's Travels in two small volumes, commenced in parts, will be finished before the close of the year, and will be a welcome edition to many readers, for whom the five volumes of the first edition are too bulky and tedious.

A large Historical Map of Europe by K. von Spruner, the well-known author of the large Historical Atlas, is nearly ready for publication. It is executed at the instance of the King of Bavaria, consists of nine sheets, and is drawn on the scale of $\frac{1}{\text{[illegible]}}$. It is very elaborately printed, and represents in three principal colours the three epochs—of ancient geography, of the middle ages, and of modern time. An Historical Atlas of the Austrian Empire, by the same author, is also nearly ready.

An important work on the glaciers of the Tyrol by the Austrian Major Karl von Sonklar is in preparation, and will soon be published. This officer has made most extensive observations, not only of the theory of glacial development, but more particularly of their connexion with meteorological phenomena in general. His beautiful surveys, plans, and illustrations of the glaciers can scarcely fail to command attention.

I am happy to learn that a work illustrative of the geology of

Bavaria, surveyed and described under the direction of C. W. Gümbel, will be published in the establishment of Justus Perthes, by authority of the Bavarian Government. Another geological work by Von Richshofen, member of the Austrian Imperial "Reichs anstalt," will also soon be published. One volume of 'Travels in Palestine,' made by Dr. Titus Tobler during the year 1857, is, I am told, nearly ready for publication.

Lastly, from what I know of their usefulness, I can well understand that the 'Geographische Mittheilungen' should have been so generally encouraged and approved of, that they are to be greatly extended in the form of extra numbers, the publication of which will commence this summer. Like the fifth part of last year's numbers, which gave a résumé of the geography of South Africa, including the remarkable journeys and discoveries of Livingstone, each of these extra parts will contain one subject only.

In mentioning the works of German writers, I must specially allude to the last travels in Palestine of the late Dr. Roth. This able and well-known traveller, a Professor of Munich, whose hypsometrical measurements in the Wadi Araba were mentioned in my previous Address, died, I lament to say, of fever last summer at Hasbeiya in Anti-Lebanon, after making several tours, the results of which have not yet been published. Thus, in exploring the countries east of the Jordan, he reached (March, 1858) Kerek and Tafileh, remained at both places for some time, and investigated the natural history and meteorology of that little-known region. Subsequently he returned to Jerusalem, and thence went northwards to the upper basin of the Jordan and the range of Anti-Lebanon. Some of the last points visited by him were Mount Hermon, Lake Phiala, Baneas, and Hasbeiya; having previously obtained many valuable scientific results. Among his former labours it will be remembered that he accompanied Schubert and Erdl in 1836 and 1837 to Palestine, as well as Major Harris in his mission to Shoa in 1841-1843. Just as in his preceding tours through the Wadi Araba and other parts of the Holy countries, Dr. Roth bestowed great pains in fixing the altitudes of his route and of the chief points visited, and his observations will be found to be among the most trustworthy hitherto made in Palestine. These altitudes, together with various meteorological observations and the last papers of Dr. Roth, having been put into the hands of Dr. Petermann for publication in the 'Mittheilungen,' that gentleman has obligingly sent me the subjoined list of heights in French feet.*

Russia.—The accomplished Secretary of the Imperial Geographical Society, M. Lamansky, has transmitted to me his clear and well condensed 'Compte Rendu' of the progress of that body, and has this year prepared an Appendix, which the geographical reader will find most instructive and useful, since it enumerates all the works bearing on our subject which have been published in the Empire of Russia.

But besides the important expeditions in operation and the production of works, to some of which I called your attention last year, and others which are mentioned in the last résumé of M. Lamansky, our correspondent has recently made me acquainted with information which I hasten to communicate.

The Geographical Society of St. Petersburg has this year sent forth M. Schmidt, an able geologist of the University of Dörpat, well known to me by his valuable researches among the Silurian and Devonian rocks of the Baltic provinces of Russia, to study the structure of the great basin of the river Amúr and of the island of Sakhalin, and to report upon the geological relation and mineral wealth of this vast region. Following the judicious plan of thoroughly working out the details in every examination of a new country, the Imperial Government, counselled by the Grand Duke Constantine and the Geographical Society, have ordained that this expedition of M. Schmidt shall be employed for three or four years, during which time the explorers will not confine their researches to the banks of the great river, but will push up its affluents, into the large mountain chains from which those streams descend. The great chain of Khin Jhan and the large island of Sakhalin, both highly interesting in a geological point of view, will be specially explored, and, looking to the unquestioned talents of the leader of the expedition, we may hope, with great success.

Another expedition has been sent into the heart of Central Asia to beyond the river Ili and the Lake Balkhash in the Kirghis steppes, to the confines of Chinese Turkestan. The chief object of this survey, which is conducted by Capt. Jolubeff, is to determine the geographical position of the principal points, so as to lead to the construction of an exact map of those wild countries which so many Russian travellers, including M. Semenoff, have already explored, and whose labours will thus be brought together and registered on accurate maps.

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* Mount Hermon, 8975 (according to Major Scott's observations, 8798); Hasbeiya, 2334; Banias, bridge over the Jordan, 1194; Lake Phiala, 3100; Lake Merom, 265 (according to Berton, 322); Safed, 2619 (according to Symonds, 2604); Tiberias, near the Castle, 323; Mount Tabor, 1754; Nazareth, 1137; Mt. of Olives, 2598; Zion, Christian Cemetery, 2530; Hebron, 2738; Kerek, 3318; Tafileh (Lower), 3363.

An important expedition to Khorassan has returned from Herat, and the general résumé of its labours, which has been alone as yet made known, is highly satisfactory. This vast region has hitherto been slightly examined only by accurate topographers, and the Russian geographers have therefore been able to make many corrections in the pre-existing maps. Among other errata M. Khanikoff cites in his report, that the town of Tebes of the old maps must change position to the extent of 1° 30′ of long. to the west, and 1° of lat. to the south; whilst numerous corrections are applied to the general configuration and orography of the country as laid down on previous maps. Other data, which have been got together respecting the geology, botany, zoology, ethnography, and historical monuments of this little explored region, give to this expedition to Khorassan the scientific importance of a general survey.

The river Ussuri, one of the affluents of the great Amúr, and which constitutes the boundary between Russia and China, was last year examined by Captain Veniukoff, and for the first time its banks were examined in their whole length. The French missionaries De la Brunnière and Venant had indeed explored this river partially, but, unfortunately, the assassination of M. de la Brunnière was accompanied by the loss of all his papers. Starting from the mouth of the river, M. Veniukoff ascended the chain of mountains from which it flows, and descended to the sea in the Gulf of Vladimir; and the description of his journey, with two maps, which is published in the Journal of the Imperial Geographical Society, which we are about to receive, will no doubt be viewed with deep interest by all true geographers.

The geographical science of the empire is about to receive a great addition in a general admeasurement of the levels of Russia in Europe, on a plan laid before the Government by Professor Otto Struve, of the Imperial Observatory of Pulkowa, and on the basis of preliminary observations carried on by him in the environs of St. Petersburg. This operation will doubtless prove of immense advantage in all industrial and engineering works. Professor

Struve has farther instructed and organized two parties intended to make astronomical observations on the frontiers of Russia and China, and particularly with the view of determining the cartography of the country adjacent to the great internal lake of Issyk-kul.*

Switzerland.—Our indefatigable correspondent, M. Ziegler, acquaints us, that through the energy of General Dufour, who directs the survey, the great map of Switzerland is tending rapidly to completion, six sheets only remaining to be finished; three of which have been plotted. M. Ziegler has also forwarded to us a map which he has prepared to show the positions of all the Celtic remains found in Switzerland up to last year.

In alluding to the progress of geography in a country of such striking configuration, and in exploring the structure of which I have spent many enjoyable days, I commend to your notice a beautiful work just published, entitled 'The Peaks, Passes, and Glaciers of Switzerland.' This work is the produce of the Alpine Club, an association already numbering more than 100 members (many of them Fellows of our Society and friends of my own), who, instigated by the writings of Agassiz, James Forbes, Studer, and others, have devoted their energies to the special object of exploring and making better known the highest and most inaccessible portions of the Alps.

In the last five years these Alpine volunteers have succeeded in ascending the highest point of Monte Rosa, the Dom, the Great Combin, the Alleleinhorn, the Wetterhorn Proper, and several other peaks never before scaled. The narratives of the adventurous undertakings set forth in this volume contain evidences of perseverance and personal endurance under difficulties which make us rejoice that our enterprising countrymen should have collected a mass of information of great interest to the lovers of adventure whom I now address.

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* Among various other geographical operations of which I have just received notice from Mr. Petermann, the following may be mentioned:—Trigonometrical surveys have been made in the last year in the Governments of Kostroma, Voronesh, &c., and on the right bank of the Volga from Saratov to Volsk. Astronomical operations have been carried on in Viatka and Vologda. Travelling over 10,000 versts in five months, the two astronomers employed fixed 38 points in the first, and 37 in the second of these large Governments, which, from personal experience, I can testify are not easily traversed. Topographical surveys are being executed in the Governments of St. Petersburg, Esthonia, Kharkov, &c., including enlarged plans of various towns. Beyond the limits of Russia in Europe a vast region, extending from the country of the Cossacks of the Ural (including the Ust-Urt) to the Bay of Kara Boghaz, as well as on the east side of the Aral Sea, have been surveyed. The results of the survey of the boundary-line between Turkey and Persia, executed by a Commission composed of Russian, English, Persian, and Turkish surveyors, are now being laid down in the Depôt de la Guerre at St. Petersburg, on the scale of 1 : 73,500.—*June*, 1859.

Knowing the ability with which my friend Mr. John Ball can master any branch of natural history science, I congratulate the Alpine Club on having secured his services as their editor. With such contributors as those whose names appear in this volume, we may feel sure that many other Alpine scenes will be racily and faithfully delineated. One of the most interesting communications in the estimation of a geologist like myself is the comparison by Professor Ramsay of the former and very ancient glaciers of Snowdon in Wales (which come into the category of geological dynamics) with the less ancient glaciers of Switzerland, from the moraines of which the ice has shrunk away within the historic period.

The lively descriptions of the tourists, and the chromo-lithographic sketches of the chief scenes, will attract many a traveller to the Alps; whilst the accompanying little maps will be found clear and useful.

France and other Continental Countries.—As our Library contains the full Report of the Proceedings of the Geographical Society of France, it is unnecessary that I should swell this Address by giving extracts from that useful and meritorious publication; and as I have not this year been favoured with the official Report of the progress of the surveys by land and by sea in France, Spain, or Italy, I am unable to allude to them. It is, however, gratifying to me to learn that the geographers of France have recompensed the brothers Schlagintweit, on whose discoveries I dilated last year, with the gold medal of the French Society.

ASIA.

Persia.—We have been indebted to the Hon. C. Murray, H. M. Minister at the Court of Teheran, for communicating to us an interesting account of the ascent of Mount Demavend by Mr. Thomson and Lord Schomburg Kerr, who are attached to his mission. Besides travelling over and describing an extensive portion of the mountainous region between Teheran and the depression which extends to the Caspian Sea, these zealous diplomatists made three ascents of Demavend, and, measuring its altitude by boiling water, came to the conclusion that the summit (which is composed of volcanic and sulphureous materials) was 21,500 feet above the sea. In support of the measurement of our countrymen, I learn by a letter recently received from M. Otto Struve, of the Imperial Observatory of Pulkowa, that by his deductions, calculated in 1851, from M. Lenne's geodetic observations, made in 1838 (see 'Memoirs of the Imp. Acad. of Science,' 1851), Demavend had the height of 20,085 French feet assigned to it. This independent testimony is of great value; the approach to agreement being the more remarkable, considering the comparatively feeble instruments employed both by the Russian and English parties.

Hence is it certain that Demavend is much loftier than the Ararat of geographers, which lies at the south end of the Caucasus, and has an altitude of 17,112 feet only. But if that name is to be applied to the highest summit in Western Asia, we are assured by Sir Henry Rawlinson that Mount Júdi, overhanging the plain of Assyria, is much higher than Demavend, and is actually considered by the inhabitants to be the mountain on which the Ark of Noah rested. As our eminent medallist Sir Henry is about to proceed to Persia, there to represent our Sovereign, we may feel assured that, with his love of research, he will not quit his post until he has taken steps to clear up these points, and also to make us better acquainted with the geography of the interior of Persia, particularly that portion of the kingdom which lies adjacent to the Caspian Sea.

In the observations I offer on the progress of geography among the Russians, the reader will find that the recent expedition of M. Khanikoff has produced a greater rectification in the positions of some important places.

China, Japan, and New Guinea.—The additions to our acquaintance with the coasts, ports, and interior of the vast Empire of China, which have been made during the last year, are very considerable. By the judicious and decisive measures of Her Majesty's Ambassador, the Earl of Elgin, and the skill and energy of our naval armaments, commanded by that excellent officer Admiral Sir Michael Seymour, combined with those of our allies, the river Peiho has been ascended, the great port of the capital occupied, and a treaty prescribed to the Imperial Court—the first example of equal diplomatic relations between China, Japan, and the commercial nations of Europe and America.

Our zealous and enlightened associate, Captain Sherard Osborn, commanding the *Furious* steam-frigate (in which Lord Elgin sailed), has furnished us with vivid descriptions of the nature of the coast, soundings, and anchorages between Shangae and the Gulf of Pecheli, as well as with accounts of that gulf and of the river Peiho.* This officer has not only the talent of clearly developing the geographical features of a country, as well as the characteristic habits, trades, and occupations of its inhabitants, but he does this in such lively and attractive language, that the reader of our Proceedings can now precisely picture to his mind's eye how Shangae has risen to its present state of opulence, can fancy himself lying at anchor in the Gulf of Pecheli, sounding the bar of the Peiho, or disembarking among shoals of canoes while pressed upon by curious Chinese, as he wends his way through Tien-sin, the populous and filthy great port of the capital.

But of all the operations which have been carried on in China, no one has proved so truly surprising to the geographer as the recent ascent of the great river Yang-tse-Keang by the Earl of Elgin. On this remarkable occasion we are again in company with Captain Sherard Osborn, who, together with his excellent officers, has given us a detailed chart of the river. We have been also furnished with an admirable description of the operations of this successful voyage by our Associate Mr. L. Oliphant, the Secretary of Lord Elgin—already well known in the literary world; so that from the combination of the talents of these gentlemen, documents relating to the course of the mighty stream have been laid before us which are of the deepest interest to the geographer, the statist, and the merchant.

It may fairly be said that never was an expedition of this nature carried out under such strange and striking circumstances; for never before did a squadron of armed steamers, one of them drawing 16 feet of water, penetrate into the interior of a great continent for between 600 and 700 miles—a distance equal to the length of the Danube in a straight line from its mouths to near Vienna. Again, when we consider that large portions of the banks of the river were occupied by a hostile rebel force, the batteries of which offered resistance at two critical points of the voyage, and that the whole tract was more or less in a state of ruthless civil war, our astonishment increases. Such an achievement it may safely be said would have been impossible in any other age than the one we live in. On referring to the chart of Sherard Osborn and his naval associates, we find that this wonderful voyage to and fro, *i.e.* for a distance of about 1250 miles, was performed in the short space of 46 days, exclusive of 12 days spent off the city of Kew-Keang; and, when we peruse the lively and clear description of Mr. Oliphant, our surprise rises to admiration. It is then that we find what difficulties our gallant seamen encountered and overcame, caused by the extraordinary changes which are continually going on in the banks and bottom of the great river. Seeing that in the year 1844 the river had been already and accurately surveyed, as far as Nankin, by those excellent officers Kellett and Collinson, it might have been expected that up to that point at least, the charts might to some extent be depended on; but, as Oliphant narrates, "24 hours had scarcely elapsed before every ship in the squadron had discovered a new sandbank by feeling it with her bottom. Shoals had been converted into islands, or had disappeared altogether, and the spot formerly avoided as a danger was now discovered to be the deep and safe channel. But this entire transformation was not confined to the bed of the river alone. In some places its banks were similarly affected, former landmarks having disappeared or become so altered as to be no longer distinguishable." Farther up the stream, as the voyagers neared Nankin (and where landmarks have not changed), 6 feet of water only were sounded where Collinson had found 6 fathoms. These remarkable variations, common to all rivers having a long course over alluvial tracts, although not to the same extent, show that if a steady commerce is hereafter to be carried on, the re-surveys of the stream must be frequent.

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* *See* the account of the statistics of the port of Shanghae.—Proc. Geogr. Soc., vol. iii., p. 57.

A few observations on these striking natural phenomena may here be permissible. Descending in two main streams from the Pering mountains, which divide China proper from the unknown regions of Tartary, the Yang-tse-Keang, which is estimated to have a length of 3300 miles, is thus remarkable in being navigable by large ships for upwards of a fifth part of its whole length! Being the largest river in the Old World of geographers, and exceeded only by the Mississippi and the Amazon in the New World, this long body of water is swelled by numerous affluents, chiefly from the north, but also by some on its southern shore. The former, flowing from lofty snow-covered mountains, and consequently rushing forth with great vehemence in the early summer season, necessarily carry down with them vast quantities of sand and detritus, thus explaining how, in its course seawards, the trunk-stream is either rapidly obstructed in one part of its bed, or deepened in another by new and powerful currents. Thus it is that in no part of the civilized world has man been more stimulated than along large portions of the banks of the Yang-tse-Keang, where the moveable surrounding objects have compelled him to apply his industrial and inventive talents. For, after the floods of the rainy season have retired from the lagoons and temporary shallow lakes which spread out from the great central river of China, wherever its banks are low, the inhabitants flock rapidly to the desiccated soil, cultivate it zealously, and inhabit temporary dwellings until the next approaching inundations drive them into higher grounds.

The accumulations and excavations occasioned by the Yang-tse-Keang are indeed good illustrations of certain geological phenomena. They teach us to be cautious in inferring that much time has necessarily elapsed in forming masses of ancient sediment which have since been converted into stone. For example, the geologist who has drawn his conclusions mainly from countries watered by rivers that rise in low hills, carry with them little detritus, and exercise a small degree of degrading power, might naturally suppose that a cliff of sandstone, of 30 feet in height, composed of layer over layer, must necessarily have occupied many years in its formation; whilst the Yang-tse-Keang, fed by affluents descending from lofty snowy mountains, accomplishes such a deposit or excavates a deep channel in a single season! Hence we see the impossibility of inferring, from physical features alone, that thick accumulations of sediment or the deep denudation of lands have necessarily been periods of great duration, and hence it follows that the evidences obtained of the entombment of different animals in the successive accumulations which under pristine physical conditions have enveloped the globe and thickened its crust, when combined with the signs of their order of superposition, are by far the surest proofs of the vast antiquity of our planet.

Apart from such natural phenomena, the voyage up the Yang-tse-Keang has made known to us many circumstances deeply exciting to the political and mercantile communities; though the sketch of Mr. Oliphant would lead us to modify to some extent the alluring picture of wealth and prosperity of the interior which some writers have drawn. The rebellion has, however, caused a wide-spread desolation, which is feelingly narrated. Opulent cities have been razed to the ground and converted into jungles, where wild animals have occupied the resorts of man.

Independently, indeed, of the rebel devastation, Mr. Oliphant seems to be of opinion that the views formerly entertained of the teeming population and extreme cultivation of the region watered by the great stream have been exaggerated. He is disposed to think that even prior to rebel invasion the cities never could have equalled in number or extent the accounts which have been current respecting them. Thus, instead of a population of 8,000,000, ascribed to the three cities of which Han-Kow is the chief, he is disposed to reduce the cipher to an eighth part of that number. On this head, however, we have the authority of the great Chinese scholar, Sir John Davis, who, with my lamented friend Sir Henry Ellis, partially ascended the Yang-tse-Keang in 1816, to prove how very abundant and flourishing was the population before the country was cursed with a pestiferous rebellion, which, under the false pretence of Christianity and religion, has enabled a collection of lawless and destructive freebooters to paralyse the industry of a great country. I would indeed fain hope, that the Imperial Government of China may be aided by foreign states in suppressing this noxious and devastating insurrection; for there can be little doubt that the nations interested in establishing a steady commerce with China could, if they willed it, re-establish the Imperial Government in full possession of the country, and thus strengthen the union which has happily at last been effected.

Let us, then, turn with hope to the picture of the internal commerce sketched out by our associate, Mr. Lockhart, who last year placed before us those data on Chinese authority respecting the importance of the great interior port of Han-Kow, which have been entirely confirmed by the exploration of Lord Elgin. We may, indeed, feel certain that when commercial relations are established with that port, to which Mr. Lockhart specially directed attention, smaller vessels will soon pass still farther up the river to new and important stations of intercourse with the natives; whilst daring travellers, no longer experiencing the difficulties which beset them of old, will penetrate towards the very sources of this mighty stream,* and eventually make us acquainted with that vast interior which separates China from Hindostan. In the mean time let me commend to the perusal of all those who desire to become acquainted with the internal resources of China and its trade a most instructive short pamphlet of my friend Mr. John Crawfurd. That paper, which was given as a popular lecture before the Philosophical and Literary Society of Leeds, is the clearest and best condensed account of the people and productions of this remarkable empire which has fallen under my notice.

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* I learn from Mr. Joseph Edkins, the associate of Mr. W. Lockhart in China, that the Chinese possess written records of all the enormous changes which the great river Yang-tse-Keang as well as other streams have undergone for many ages back. The fertilizing of large tracts by fresh water floods—the barring out of the tides by which the salt water would have sterilized good lands—the regulation of the system of canals and embankments, are explained in works mentioned in the brief but pregnant announcement of Mr. Edkins, which will be read before the Society, and printed in our Proceedings. Some of these works are among the oldest geographical documents. Thus, the Section of the Shooking (Book of History) called Yu-Kung consists of a geographical description of China in the time of the famous Emperor Yu, who, about 2000 years before Christ, restored the country to a condition fit for agriculture after a great local deluge. On his return to China, Mr. Edkins will work out many curious data of the comparative geography of this singular and learned people.

Japan.—Although Marco Polo, in the thirteenth century, first brought to Europe the intelligence of the existence of the chain of volcanic islands now known as Japan, this empire—one island of which is as large as Britain—has remained to a great extent unknown to us. Early in the fifteenth century, and for the brief space of ten years, a British factory existed at Firando, but that intercourse was abandoned for more profitable ventures.

To the Dutch, who have contrived, in spite of much opposition, to maintain their commercial intercourse with Japan, we are chiefly indebted for any knowledge we possess of its inhabitants. Kämpfer, indeed, opined that owing to the dangerous access to their shores, and to the prolific nature of the soil, nature seemed to have destined these islands to constitute a secluded world within themselves. Yet, the barriers have now been broken down, and the fertile Japan is opened to the commerce of the West.

As our kinsmen of the United States had the merit of leading the way in obtaining this result, we also may now rejoice that through the sagacious conduct of Lord Elgin, aided by the vigorous naval movement of Sherard Osborn, Britain has obtained that full share in the commercial advantages which are likely to flow from the new treaty.

In the treaty concluded by Lord Elgin at Yedo, or, as it is usually written by us, Jeddo, several of the restrictions enforced upon the Dutch are not applied. Hitherto, the intercourse of Europeans with Japan being confined exclusively to the small Dutch factory at the extreme point of the empire, has exercised no influence whatever upon the mass of the population. They have been as effectually secluded from the rest of the world as if the great island of Desima did not exist, nor have the products and manufactures of the West penetrated as yet into the cities and villages of Dai Nipon. Doubtless, it may require time to create wants in a population hitherto so independent of the rest of the world, but the acquisitive and imitative instinct of the native of Japan is so remarkable that he will rapidly discover the merits of Western arts and manufactures, and apply them to his own uses. Already, as Mr. Laurence Oliphant informs me, the Japanese is a sufficiently experienced navigator and scientific engineer to dispense with the assistance of foreigners in steaming from Nagasaki to Yedo—a voyage which usually occupies a week. Again, as the same informant tells me, one of the most enlightened princes has laid down an electric telegraph between his palace and the chief cities of his province, whilst a diving-bell and Nasmyth's hammer are in full operation, under Dutch supervision, in the harbour of Nagasaki. There is, therefore, no reason to doubt that these people will be less ready to adopt our manufactures than our scientific inventions. With six ports open to the unrestricted transmission of imports into the interior, our home products will, in all probability, penetrate into every corner of the empire. In the winter, the furs and cloaks padded with cotton will be replaced by woollens, a production unknown in Japan, where sheep have not yet been introduced. Again, sugar, one of the few articles for which they depend largely on China, though now a luxury, may easily be rendered a necessary of life; for it can be far more cheaply furnished by our merchants from such countries as Java, Siam, and Bengal than from densely-peopled China, which itself receives supplies from some of these countries.

Situated in a temperate latitude, and with an industrious, ingenious, and docile population, which is probably not overestimated at 40,000,000, Japan is marked by productions not very dissimilar from those of the south of Europe. One of the most remarkable of these is insect wax, a cargo of which has already reached this country and proved a most profitable investment. Camphor, silk, and tea of a superior quality are produced in great quantities, as also hemp, flax, and tobacco. In their manufactures of iron, copper, glass, wood lacquering, China paper, steel, &c., the Japanese have attained such great perfection that the Western manufacturers may even gain some useful hints from them. Without, however, entering into farther details, or venturing upon an oversanguine estimate of the capabilities of this new field for the energy and enterprise of Europe, we may augur well from this fact, that between thirty and forty millions of such customers have been added to our list. Nor while we appreciate the advantages of this new market are we unmindful of the benefits to geographical inquiry which are likely to result from this most interesting field of exploration. We know at present but little of the topographical configuration of the country beyond the meagre accounts we have received from the Dutch. The Japanese themselves have, indeed, graphically illustrated some of the most striking features of the natural scenery and customs of their country, and in a manner which shows no small proficiency in art. Ere long the singular scenes around the great volcano of Fusi jama will doubtless be visited by our travellers, as Lord Elgin's treaty secures for the British Consul-General and all gentlemen connected with him the right to visit every part of the empire.

Let us hope, however, that the intercourse of other nations with this peculiarly ceremonious race—in which woman occupies a higher station than in any other Asiatic country; where the habits of the people are neat, clean, and orderly; where the laws are short and clear, and where professional lawyers are unknown—may not bring upon these hitherto secluded lands those curses of demoralization which too often attend upon the influx of a higher civilization.

Indian Archipelago.—The additions to our knowledge of the Indian Archipelago for the year are confined to two papers, supplied by Mr. Alfred R. Wallace and Mr. John Yeats. These relate to New Guinea, after Borneo the greatest island in the world, and, at the same time, the least known. Both papers furnish the largest and most authentic contributions to our knowledge of this tropical, forest-clad land, little less than double the extent of Britain, and inhabited by austral negroes in a social condition incomparably lower than that of any of the negro tribes of Eastern or Western Africa; but, rude as it is, destined, I have no doubt, in time to rise to importance in relation to the adjacent Australian continent, where wool, gold, and British enterprise are rapidly creating a mighty empire.

Mr. Wallace, who last year furnished us with an authentic and valuable description of the neighbouring and curious group of the Arru Islands, was, as he himself truly observes, the sole European inhabitant, and we may safely add, the sole civilised being, of New Guinea for three months. The researches of this skilful naturalist were necessarily confined to a small portion of the island, Doree, which lies at the western extremity of the great bay which indents its northern coast. Mr. Wallace's paper supplies us with by far the best account of the geology and geography of the place he visited, while other Societies have properly received his contributions to botany and zoology.

The paper for which we are indebted to Mr. Yeats is a translation from the Dutch of Dr. Salomon Müller, the learned and judicious naturalist of one of the expeditions which the Dutch Government sent out for the exploration of New Guinea in the years 1826, 1828, and 1835. It describes a considerable portion of the south-western coast of this hitherto unknown country, and is itself a small portion of the great work on the people, languages, natural history, and resources of the Dutch possessions in India, composed and published under the auspices of the Netherland Government. Should the enlightened recommendation of Sir William Denison, alluded to under the heading of Australia, and backed as it has been by the Council of this Society, meet with the approbation of our own Government, we may hope to see the worthy example of the Dutch Government followed on a still larger scale.

In speaking of the Indian Archipelago, it may not be out of place to mention that by a recent and practical examination of the coal-fields of Borneo, those of the British island of Labuan have been found to be incomparably the best as to quality, extent, and facility of working. Our capitalists have not been slow to take advantage of this, and are about to work the mines. It would be superfluous to dwell on the vast advantages of a cheap supply of coal in our present enlarged intercourse with Australia, China, Japan, Siam, and the islands of the Archipelago.

Mr. H. Wise, a gentleman long familiar with the question of Indian navigation, has furnished the Society with an ingenious Memorandum (accompanied by a map) on the means of shortening the route from the Western world to China and Japan by cutting a ship canal through the narrow isthmus which divides the Gulfs of Bengal and Siam. Communications on the subject have also been received from Sir Robert H. Schomburgk, our Consul in Siam. The subject is not, however, ripe for discussion, and all that I need observe upon it at present is, that it is one which comes eminently within the province of the Geographical Society, and is well entitled to our best consideration.

Admiring and respecting as I do our eminent Medallist Sir James Brooke, whose skill, perseverance, and courage laid the foundation of an important settlement in the Eastern Archipelago, I cannot close this brief reference to that region without expressing my gratification that at a period when the health of this distinguished man has been materially affected, he should have met with that generous sympathy and support of a large body of his enlightened countrymen, which will, I trust, act as the best restorative of a frame which has been overworked in the great endeavour with which his name will ever be associated.

AFRICA.

Discoveries of Burton and Speke.—The last discoveries in the interior of the eastern side of this great continent have already been adverted to in the adjudication of our Founder's Gold Medal to Captain Burton.

In the few words I addressed to that distinguished explorer in presenting to him that Medal, a brief but pregnant allusion was made to the labours and researches of his associate Captain Speke; and in now expatiating on the results of their remarkable and successful explorations, the chief of the expedition, who is already well known by his bold peregrinations and publications, will, I am sure, be happy that I should offer in the annexed note * a slight sketch of the antecedents as well as of the special duties executed by his companion.

Returning to Europe from Aden, both Captains Burton and Speke sought and obtained employment in the Turkish contingent of the allied armies operating in the Crimea. Thrown out of their military career by the peace, they returned to the east coast of Africa, with the view of exploring the country from the coast of Zanzibar as far inland as might enable them to ascertain the real geography of the interior in that latitude.

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* Quitting England at the age of seventeen as an officer of the Indian army, Captain Speke was engaged in four general actions under Sir Colin Campbell. Peace being established in the Punjaub, he obtained leave on several occasions to indulge his natural taste for field sports, and the collection of specimens of the animals of Tibet, the Himalyas, and Upper India. In those remote and snowy mountains he made himself a geographer, and with a simple compass and watch plotted out tracks for the benefit of future explorers. In 1854, obtaining three years' furlough, he started with a large outfit at his own expense to explore Central Africa, and collect its fauna. Arrived at Aden, General Outram permitted Lieut. Speke to be embodied in the expedition under Captain Burton, destined to explore the Somauli country from Berbera. Whilst this expedition was waiting to proceed with the usual annual caravan to Ugadin, Lieut. Speke, with his chief's permission, entered the Somauli country as far as Ras Kori, and crossed the coast range into the interior plateau ground. In the space of six months he constructed a sketch plan of those tracts, and made large collections of their flora and fauna. After his return to Aden, he again started alone for the Somauli coast at Karam, purchased camels, and proceeded to Berbera, the rendezvous of Burton's party. When the British officers had there established themselves, their camp, as is recorded in your Journal, was attacked by the Somauli, who, seizing all the stores, killed Captain Stroyan, wounded Captains Burton and Herne, and wounded and captured Speke. But escaping, as he says, miraculously, he rejoined Burton and the survivors, and returned to Aden.

Aided by the late Colonel Hamerton, our meritorious Consul at Zanzibar, and by Seyd Majid, the second son of the Imaum of Muscat, now the Prince of Zanzibar, the travellers made an experimental journey from that place on the coast to Fuga in the mountain country of Usambara. In their last and great expedition they again proceeded from Zanzibar. Their party consisted of twelve Beloochees furnished by the kindness of the Sultan, some negroes who had been slaves, and asses for the transport of goods and for riding. Passing over the delta and low hilly country called M'rima, they entered the mountainous coast range at about 120 miles from the coast. This range, which rises to a maximum altitude of 6,000 feet, with a width of about 90 miles, is chiefly composed of sandstone and crystalline rocks, the true character of which will be ascertained when Captain Burton's specimens arrive.

Descending from the coast range to the great interior plateau land, at a lower level, and travelling over some poor lands, they reached a rich country in which knolls or bosses of granite and basalt rise up like rocks in an ocean. This country is exclusively peopled by negroes, none of whom are Mahomedans, as are the Somaulis and trading Arabs of the coast.

Like the Negroes described by Livingstone, they have no special religion, trusting solely to good and evil spirits. Such of them as have sultans are on the whole peaceable, fire-arms being rare among them. Their country produces cotton, tobacco, maize, sweet potatoes, a great variety of pulses, manioc, yams, plantains, and melons: they manufacture iron, cotton fabrics, have abundance of cows and goats, and live in comparative comfort.

From Kazé, in Unyanyembé, a spot where the Arab traders have established a sort of mart, and where articles from the coast are bartered for ivory and slaves, the travellers moved westerly until they reached the long inland mass of water trending from S. to N., which has been styled Uniamesi and Ujiji, but the real name of which is Tanganyika.

This lake was found to be 1,800 feet only above the sea, or about half the average height of the plateau land west of the coast range. It has a length of about 300 and a breadth of from 30 to 40 miles.

This great internal mass of water was determined to be an insulated depression into which streams flow on all sides. It was crossed by Speke in the centre, and navigated conjointly with Burton to near its northern end, where it is subtended by mountains which were estimated to have a height of from 6,000 to 7,000 feet within the range of the eye.* Its waters are perfectly fresh and peculiarly agreeable to drink, and it abounds in delicious fish, whilst its banks are grazed by red oxen of large size, some of them having stupendously long horns. Oxen are indeed common over nearly all the region examined, for the *tsetse fly*, the scourge of the more southern African countries, in which Livingstone travelled, is unknown.

A singular phenomenon of blindness affected for some time both the travellers. Whilst exposed in the arid, hilly coast range, and also in the plateau land, to a fierce and glaring sun, their sight was unaffected; but on descending into the verdant, well watered, and rich lacustrine expanse of Tanganyika their sight was dimmed, and gradually they became almost blind—their recovery being slow and imperfect. It was this calamity alone which diminished the number of astronomical observations made by Captain Speke, who lost no opportunity of fixing the latitude and longitude of numerous positions.

When returned to their chief central station in Unyanyembé, Speke, thriving upon hard field work, left his invalid companion in order to reach the great lake Nyanza, the position of which had been pointed out to him by the Arabs, who asserted that it was much longer and larger than Tanganyika, from which it is separated by about 200 miles. In this journey Captain Speke, accompanied by his faithful Beloochees, passed through the district where the chief iron works of the country are carried on; the native blacksmiths smelting the ore with charcoal.

The great lake Nyanza was found to occupy the position assigned to it by the Arabs, and the E. longitude being very nearly that of Kazé, viz., 32° 47',† its southern end was fixed at 2° 30' S. lat. Ascending a hill and looking northwards, the enterprising traveller could discern nothing beyond the islands termed Ukerewe, but a vast interior sheet of water, which, according to those Arabs, whose information had hitherto proved correct, extended northwards for upwards of 300 miles. Captain Speke, who estimates the breadth of this internal sea at 90 miles near its southern end, further ascertained that it is fed not only by streams flowing from the mountains which separate it from Lake Tanganyika, but also by other streams, many of which, meandering in the lower plateau to the west of the lake, constitute, like the internal rivers described by Livingstone, a watery network which when supersaturated by the rains burst and overflow the country.

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* Since this Address was delivered, the British Museum has acquired a curious, large, old Portuguese MS. map of the world, on the Mercator's projection, made by Antonio Sanches, in 1623, which shows how much general knowledge of the interior of Africa was possessed at that period by the Portuguese. On this vellum map, the author distinctly places one large body of water in the centre of Africa, and in the parallel of Zanzibar. Although all the details are inaccurate, and he makes the Congo flow out of this lake to the West, and another river (representing probably the Zambesi), which is called R. de St. Yorges, from the same to the S.E., still the general notion of great internal waters is there put forth.

Chevalier Pertz has recently discovered in an old MS. in the Royal Library at Berlin that, even in the year 1291, two Genoese navigators, Teodosio Doria and Ugolino Vivaldi, sailed for a certain distance down the West Coast of Africa. Their ships were called *Sant' Antonio* and *Allegranza*, and the last-mentioned name has, indeed, remained attached to the most northern of the Canary Islands. It has been erroneously stated in some journals that these Genoese navigators sailed round the Cape of Good Hope.—*June* 20, 1859.

† Lunar observations were made at this station.

Seeing that this vast sheet of water extends due northwards, ascertaining by his thermometer that it was nearly 4,000 feet above the sea, and knowing that its meridian was nearly that of the main course of the White Nile, Captain Speke naturally concludes that his Nyanza is the chief source of that mighty stream on the origin of which speculation has been so rife. This view seems to coincide with the theoretical speculation laid before this Society by myself in preceding years, and is in accordance with the data worked out by Livingstone, of a great interior watery plateau subtended on its flanks by higher lands, and from which interior plateau the waters escape to the sea by favouring depressions.

The physical configuration of the land to the east of the great Nyanza Lake is indeed strongly in favour of this view. On that side, and at a distance of about 200 miles from its banks, the eastern coast range of Africa rises from 6000 feet in the latitude of Zanzibar (where it was passed by our travellers) into a lofty range or cluster, of which Kilimanjaro forms the southern and Kenia a northern peak.

If the assertion of Rebmann and Krapf be accepted, that perpetual snow lies on those mountains, though the able critical essay of Cooley* had induced me to suppose that these missionaries might have been somewhat misled, the summits of these mountains must have an altitude of upwards of 18,000 feet. At all events it is granted that they are the highest points of this coast range. Now, whilst streams descending from the western flank of Kenia (Kilimanjaro is too far to the south) may probably be feeders of the great Nyanza Lake, which occupies a long lateral north and south depression in the plateau on the west, we know from its meridian as now fixed, that the direction of this fresh-water sea points directly to Garbo, the spot in latitude 3° north reached by M. Ulivi, as related by Brun-Rollet, a Sardinian, who had established a trading post at Belenia in latitude 4° 50′ north, on the White Nile in 1851. The north and south direction of the Nyanza, which Speke believes to reach from south latitude 2½° to 3° 30′ north latitude, brings us in fact beyond the Garbo of Ulivi and Brun-Rollet.[*]

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* *See* Cooley's 'Inner Africa Laid Open,' p. 126.

The variations which occur in the height of the waters at different seasons, in the interior plateau-country surrounding the great lake, were strikingly described to Captain Speke by the Arabs, when they assured him that at one season of the year the water lilies were so abundant as to enable the traveller to pass over a wide river by treading on their broad and thick floating leaves, showing how flat the country must be, and how sluggish are the streams.

Let us hope that when re-invigorated by a year's rest, the undaunted Speke may receive every encouragement to proceed from Zanzibar to his old station, and thence carry out to demonstration the view which he now maintains, that the Lake Nyanza is the main source of the Nile. Considering the vast difficulties which beset the traveller who attempts to penetrate southwards by ascending the Nile, it seems to be preferable that the effort should be made from Zanzibar, where Captain Speke is sure of being heartily supported by the Sultan, and whence, taking men on whom he could rely, he can certainly calculate on reaching the Lake Nyanza in good plight, for that zone of Africa which he has passed through is now ascertained to be occupied by a much more tranquil people than those of the countries north and south of it.

On former occasions I contended that the periodical overflow of the waters from the internal fresh-water lakes was explicable by the fact, that at certain periods of the year, differing of course in different latitudes, the rain-fall of several months would at last so supersaturate the interior plateau-lands and lakes as to produce periodical annual discharges. That the lofty mountains of the coast-range, of which Kenia is the chief peak, may throw off certain feeders of the White Nile, just as the mountains of Abyssinia feed the Blue Nile, must probably be the case: but whilst it may be admitted that little snow may occupy the peaks or summits of

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[*] M. Jomard has analysed and compared the discoveries of M. Brun-Rollet, who gives some information derived from De Angelis, who resided at Belenia in 1851, which is worthy of attention. But speculations founded on such uncertain data are of no great value.

Kilimanjaro and Kenia, I am of opinion with the learned Cooley* that the elevation and mass of these mountains are not such as would sustain a vast range of snow and ice, the melting of which would account for the annual rise of the Nile. Even if it be assumed that this is really a snowy chain, the exact periodical rise of the Nile could never be caused by a periodical melting of its snows, since the power of the sun under the Equator is so nearly equable throughout the year, that it must operate in filling the streams which descend from the mountains with pretty much the same amount of water at all seasons. The great phenomenon of the periodic rise of the Nile is, it seems to me, much more satisfactorily explained by the annual overflow of a vast interior watery plateau, which, is, thanks to Captain Speke, ascertained to have an altitude much more than adequate to carry the stream down to Khartum, where the Nile is believed to flow at a height of less than 1500 feet above the sea; and as the river below that point passes through an arid country, and is fed by no lateral streams, it is to the southern, central, and well-watered regions that we must look for the periodic supply.

On consulting Captain Speke respecting the rainy season of that part of the interior of Africa which lies between Ujiji and Unyanyembé, I find that in about east longitude 30° and south latitude 5° the rains commence on the 15th November and end on the 15th May, during which period of six months they fall in an almost continuous downpour. Farther northward, where the Lake Nyanza lies, the rainy season, in the common order of events, would commence, he supposes, somewhat later, and probably at a time which will account for the periodical rise of the Nile at Cairo on the 18th June. In support of this view, Captain Speke states that the river Malagarazi, which drains the surplus waters from the south-east slope of the mountains between the Lakes Nyanza and Tanganyika, when first crossed by the expedition, was within its banks, but on the 5th June it had quite overflowed them and constituted a stream 100 yards broad, running westwards into the depressed lake of Tanganyika. Now, as according to the Arabs, and other intelligent men with whom he conversed, the whole region to the northward of the mountain in question, *i. e.* beneath and to the north of the Equator, is an extensive marshy plateau, intersected by some large and innumerable smaller streams, all feeders of Lake Nyanza, we have only to suppose that at the *close* of the rainy season the great discharge occurs, and we then have in these data strong grounds for believing, that the theory which I ventured to propound to this Society as the best explanation of the overflow of the Zambesi of Livingstone, as well as of the Congo and other African rivers, will also be found to be applicable to the Nile.

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* This acute scholar has shown his power as a comparative geographer by a close analysis of the *quæstio vexata* respecting the Nile of the ancients, and shows that the true Nile of Ptolemy was the Blue Nile, which descends from the mountains of Abyssinia. He also shows that the great lakes of the Nile of Ptolemy are at the Equator—a view now confirmed by the researches of Speke. As to Kilimanjaro, he says it is "an insulated mountain in a sea-like plain, and on a fifth scale of the magnitude required for maintaining perpetual snow near the Equator." See also his work 'Inner Africa Laid Open,' in which he explains the existence of a great sea or lake in the interior of Eastern Africa.

In concluding this notice of the labours destined to clear up the problem of the real sources of the Nile, I must express my thanks to Mr. Macqueen for his efforts to collate all the data concerning the ascents of the White Nile from the expedition sent by Mahomed Ali in 1839 to that of Don Angelis, which Brun-Rollet accompanied in 1851, and when the party reached 3° 50′ north latitude, 31° east longitude. Adding to information obtained from natives and Arabs, and citing Lucan and other ancient authors to the same effect, Mr. Macqueen contends that a lofty mountain to the south-east of the cataracts of Garbo, the last station of Brun-Rollet and his companions, which must be Kenia, is the chief feeder of the White Nile, and that the river Tubesi, spoken of by the African King of Bari, is really the Tumbiri heard of by Dr. Krapf.

Now, even if this view be sustained, it seems to me to be quite compatible with the fresh knowledge obtained by Captain Speke, and his inference, that the Nyanza is the chief feeder of the White Nile. For the southern extremity of this great inland lake is but 2½° south of the Equator, whilst its western shore is probably not more than 150 miles from the lofty mountain of Kenia. Hence, seeing that Nyanza is about 4000 feet only above the sea, and that the eastern mountains, under the Equator, are much higher, there is every probability that this vast sheet of water may be fed from the east by streams flowing from Kenia, as it is ascertained to be supplied from the south-west and west by other rivers flowing from the mountains, which separate this high sheet of water from the depressed Lake Tanganyika.*

If then it should eventually be proved, that the Lake Nyanza contributes its annual surplus waters to the White Nile, so may it then be fairly considered as the main source of the great river; the more so when we see that its southern end is farther to the south, or more remote from the embouchure, than any other portion of the Nilotic water-parting.[*] On the other hand, the high mountains which flank the great stream on the east, and probably supply it with some of its waters, may by other geographers be rather viewed as the main and original source. These are the only remaining portions of the great problem which have to be worked out—a problem which it has been the desideratum of all ages to unravel, and one which, according to Lucan, made Julius Cæsar exclaim, that to gain this knowledge he would even abandon the civil war[†]—a problem which Nero sent his centurions to determine, and which, by the last discovery of Captain Speke, seems certainly now to approach nearly to a satisfactory solution.

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* Mr. Edw. Heneage informs me that Botero, in his 'Relationi Universali' (Venice, 1640), says that the eastern Nile flows out of a lake 220 miles long, situated under the Equator; and he places the sources of the western branch of that river about S. lat. 9°, close to the sources of the Zaire or Congo, and what may also be intended for the origin of the Zambesi.

Before we descend to the mouth of the Nile, and consider the nature of its delta, I must say that our excellent Swiss correspondent, M. Ziegler, has communicated to us some very interesting further details respecting the people who inhabit the northern declivities of the mountains of Abyssinia, as transmitted by his countryman, M. Werner Munzinger. The historical sketch of the affairs which have taken place of late years in Abyssinia, and particularly in the region bordering on the land of the Bogos, is accompanied by a map and dialects of that curious people. African scholars, as well as geographers, will anxiously look to the publication of the manuscripts of M. Munzinger: his map extends from 15° to 17° north latitude, and east longitude 33° to 38° east of Paris.

Delta of the Nile. Suez Canal.—Whilst Captain Speke was determining the position of the great lake which may prove to be the main source of the Nile, the distinguished Surveyor of the Mediterranean, Captain Spratt, was working out the interesting problem of the effect of the prevailing wave influence on the deposits discharged at the mouth of the greatest of the African streams, and his results have just been published by Her Majesty's Government. Examining the sea shore and sea bottom at different depths along the whole coast of Egypt, and distinguishing the real composition of the detritus brought down by the river from other adjacent deposits, he distinctly shows, that the wave stroke from the west, influenced by the prevailing north-westerly winds, has for ages been impeding the transport of any Nile deposits either to the west, or into the depths of the Mediterranean on the north, but has constantly driven them to the east.

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[*] Although both White Nile and Blue Nile are fed by many affluents, the remarkable physical feature of the great stream below their junction is that in a course of 1200 miles it is not increased by the addition of any lateral waters. On this feature, as well as on the parallelism of its course to the great N. and S. depression of the Red Sea, on the fertilizing powers of its waters, and on the periodicity of its flood, the reader will do well to consult the article "Mediterranean Sea," Edinburgh Review, vol. xvi., which is from the pen of our accomplished associate Sir Henry Holland.

[†] "Spes sit mihi certa videndi
Niliacos fontes bellum civile relinquam."—LUCAN, *Book* 10.
(As quoted by Mr. Macqueen.)

Through this unvarying natural process, Alexandria, which is on the west of the Nile mouth, has been kept free from silt, whilst the deltoid accumulations of the river have in the historic era successively choked up and ruined the harbours of Rosetta and Damietta, and have formed a broader zone in the bay of Pelusium than on any part of the coast. Again, he shows that the prevailing north-westerly wind has produced precisely the same effect upon those dunes and blown sands on the coast lands which, destroying habitations and fertile fields, fill up depressions; all these dunes being derived from those sands which have originally been carried out by the Nile from the interior of Africa, then thrown up on the shore, and afterwards transported eastwards by the prevailing winds.

With the establishment of such data, the result of many soundings at sea and much close observation on land, illustrated in three maps and two plates of sections, Captain Spratt contends, in the spirit of a fair inductive reasoner, that the proposal of M. Lesseps to form a large ship canal in the low countries between Suez and the Bay of Pelusium is wholly unwarranted.—1st. Because that bay of the Mediterranean, into which the canal is to open, is so continuously and regularly silting up, that no amount of dredging could contend against a great local law of nature, and hence that no permanent port could be formed there. 2ndly. That the blown sands drifted from the west would be constantly filling up the canal. 3rdly. That the very incoherent condition of the ground in which the canal has to be cut (being nothing more than the Nilotic sands accumulated in former days) would not sustain a steady body of water, and that all attempts to clear out its unceasing infillings of matter would be impracticable.

In this powerfully-argued paper, Captain Spratt quotes the authority of the French savant, M. Lepiré, who accompanied the First Consul to Egypt in 1800, as a sanction to his conclusions.

With an extended and accurate acquaintance as a maritime surveyor of the deltas which the Danube and various rivers throw out into the Mediterranean, Captain Spratt proves, that the arguments used by M. Lesseps, as drawn from other localities in favour of his project, are, in fact, directly hostile to it. Thus, the Malamocco entrance to Venice is to the windward side of the river Po, and therefore freed from its deltoid deposits, just as Alexandria is exempted from those of the Nile. Again, in the Black Sea the deltoid accumulations of the mouth of the Danube are chiefly to the leeward of its mouth, whilst in both these cases powerful currents tend to keep open channels which do not exist in the sluggish water of the bay of Pelusium.

In corroboration of his statements, numerous specimens of sand and mud, brought up by the dredgings of Captain Spratt, are deposited in the Museum of Practical Geology: and his pregnant words which follow may well be commended to the attentive consideration of the French Government and nation, before they get further involved in carrying out the project of a great ship canal:—

"In a gigantic engineering project, involving such an enormous outlay for its construction as well as its annual maintenance, as these facts suggest, it is necessary that the commercial interests invited to speculate in it should thoroughly understand it, so as to form an opinion whether millions of money will not be fruitlessly lost in the depths of the sea, as I must believe will be the case. The experience of the past in the difficulties of engineering against similar hydraulic and physical conditions elsewhere should not be forgotten, and to none are such facts as are here stated of more value and of more real importance than to M. Lesseps and the International Commission. At least, such is the humble opinion of one whose only object is to arrive at the truth of nature's laws, and to suggest to others the consideration of those truths, before blindly engineering against them, and thence to be certain of the cost and results before undertaking a work that will have to contend against so vast an amount of physical difficulties in perpetuity."

These conclusions of Captain Spratt are entirely in unison with the observations of my gallant friend Commander Pim, communicated to our Society at one of our recent meetings, as resulting from a visit to Egypt, which he made when he was the companion of our associate, Mr. Robert Stephenson. That eminent civil engineer has for some time, indeed, arrived at a similar opinion, and has put forth other arguments which seem to me to be as unanswerable as those of Captain Spratt.

The Niger Expedition.—The unfortunate shipwreck of the *Pleiad* on the rocks near Rabba, and the check given to the expedition under

Dr. W. B. Baikie, which left England early in 1857, were alluded to in my last year's Address. I now learn from Mr. D. T. May, R.N., who has returned to England, that less than twenty miles above Rabba the River Niger, or Quorra, divides into several rocky, intricate channels. Consul Beecroft in the *Ethiope*, in 1845, safely navigated the most available of these passages; but the voyagers of 1857 were not so fortunate, and the steamer was totally lost on the rocks. Most of the property was, however, saved, and the neighbouring bank became the head-quarters of the expedition for a whole year. The rocks forming the banks of the river where the shipwreck took place are composed of highly-inclined strata of hard sandstone. All the specimens of this rock which I have examined, whether brought home by Mr. May or sent by the Admiralty, belong to the same light-coloured, hard, sub-crystalline, pinkish sandstone, with very fine flakes of white mica; the successive layers (which are much foliated) being strikingly covered by thin elongated crystals of black tourmaline.* The rock has altogether the appearance of having undergone considerable metamorphosis, and much elevation and disturbance. Geodes of pure white quartz, with large micaceous coatings, also occur. As soon as the party had become somewhat settled, it was determined to make a direct overland communication by Yóruba with Lagos, and Mr. May offering himself for this service, accomplished it satisfactorily, as explained in a notice laid before the Society. In the mean time Lieut. Glover made journeys up the river, visiting Wawa and Busa, and definitely ascertained the impracticability of navigating the river for a few miles beyond the spot of the encampment, a waterfall at Waru being an impassable barrier even for canoes in any season.

Mr. May having waited on the sea-coast, expecting another steamer from England, at last returned to the encampment through Yóruba, and then set out on a more extended journey, with a view to exploring the country, and of establishing postal communication in a line from Lagos to the confluence. Having first travelled to Hadan (the road between Lagos and Hadan being well known and used), he passed eastward, and journeyed for many weeks through the previously unvisited districts of Ife, Ijesha, Igbouma, Yagha, &c., being warmly received, and observing everywhere that the people were quiet, orderly, and industrious; though these good qualities are here and there broken in upon by marauding or slave-catching armies, sent into the Yóruban country by powerful neighbours. The details of this journey were communicated to the Foreign Office in January last, and will, I presume, soon reach the Society.

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* I reiterate the expression of my deep regret (see vol. xxvii. President's Address, p. clxvi.), that no member of this expedition is versed in geology or mineralogy.

Approaching to within fifty or sixty miles of the confluences of the Quorra and Chadda Rivers, Mr. May was compelled to alter his route, and proceed northwards, visiting the ruined famous town Ladi, crossing the Quorra at Shaw, and journeying thence on the north side of the river through Nupe to Rabba.

Lieutenant Glover had during this time also visited the coast by Mr. May's first route, and was now there waiting to pilot up the river the steamer which was at last coming to the relief of the party. Dr. Baikie and the other members of the expedition had been chiefly employed during the year in cultivating a good understanding with their neighbours, reducing their language, &c., whilst the energies of Mr. Barton were amply occupied on the botany of this part of Africa. In October, 1858, just a twelvemonth after the settlement of the expedition at the spot in question, the *Sunbeam* steamer arrived, the whole party were then embarked, and proceeded down the river to Fernando Po, there to recruit the health of the officers and men, and make arrangements for farther exploration. During the twelvemonth's residence in Nupe the most friendly relations were maintained with the king, his brother, and chiefs, and the natives generally; supplies being often received overland from Lagos.

At Fernando Po (November, 1858), a re-organisation having taken place, and the preparations being completed, the party again set out, now in the steamer *Rainbow*, built and sent for the purpose, and endeavoured to re-ascend the river. But it was then found that this vessel, which draws four feet of water, could not ascend the Niger even in the month of January; the waters subsiding until June, when they increase. In consequence, the party was obliged again to return to the sea, and since have set out upon the land-journey from Lagos to Rabba (upon the route opened up by Mr. May), whence it is purposed to proceed with an expedition the friendly objects of which must by this time have made a due impression on the native chiefs, and from which we may anticipate the gain of much knowledge when all the acquisitions of Dr. Baikie and his associates are unfolded.

Livingstone or Zambesi Expedition.—With the exception of the accounts we received last autumn of the arrival of the great South African explorer in the Zambesi, of his ascent of the river in the little *Ma-Robert* to a great distance above Tete, of his again meeting with his old friends the Makololo, and his subsequent descent of the stream—data with which the public are already well acquainted—we have no news respecting the ulterior progress of this important expedition. If no new geographical discovery should be speedily communicated, let us recollect that the main object of Livingstone, who is now one of Her Majesty's Consuls, is to establish entrepôts for trade and commerce high up the river; and, as a prelude to such arrangements, it was most cheering to us all to learn that his stanch friends, the Makololo, had persevered in waiting for his return in a tract distant from their native land. The charts and maps of the river-banks, executed by my young geological friend Mr. Thornton, are very creditable performances. Mr. Baines, the artist, has laid before us a clear statement of the difficulties overcome in navigating the river, through rocks and shoals, with little depth of water, and the skill of Livingstone himself has been put to the test in acting, as he terms it, the part of "skipper" in the absence of Commander Bedingfeld. Whatever may be the other products derived from this region of Africa, there is a fair probability that its splendid hard trees of vast dimensions may afford fine supplies for ship building; and there are persons—including Mr. Lyons M'Leod, lately our Consul at Mozambique—who, looking to the general luxuriance of the vegetation, are of opinion that the territory on the Zambesi may be made a corn-exporting country.

The Seychelles.—In his 'Notes on the Seychelles,' we learn from Mr. Lyons M'Leod that these islands, twenty-nine in number, form an archipelago, which is the most considerable of the dependencies of the island of Mauritius. Extending from 3° 33′ to 5° 35′ south latitude, and from 55° 15′ to 56° 10′ east longitude, they lie at a distance of 915 miles from Mauritius, 566 from Madagascar, and 1470 miles from the continent of India. First discovered by Vasco di Gama during his second voyage to India in 1502, they were explored, in 1742, by Captain Lazare Picault, who took possession of them in the name of the King of France, since which date they have been called by their present name, after the then French Marine Minister. Mahé, the principal island, is about 17 miles long and 4 miles broad: it attains an elevation of 2000 feet in height, and may be seen at a distance of 12 to 15 leagues. The chief mass consists of hard granitic rock, the soil varied and productive, watered with numerous rivulets, and being well wooded, the scenery is very picturesque.

On the east side of the island the magnificent bay or roadstead, Port Victoria, about 4 miles deep and 3½ miles wide, could contain from 300 to 400 vessels, while in the harbour five or six sail of the line might be safely moored, with sufficient room for smaller vessels.

Hurricanes and gales of wind are never known there. From 1817 to 1827 a flourishing and lucrative cotton trade was carried on at the Seychelles; though the plant, which is of fine quality, has not yet been placed in competition with *sea-island* quality of Georgia, in the United States.

The sugar-cane grows luxuriantly, and no tobacco is superior to that raised at the Seychelles. Timber, for shipbuilding, furniture, and all domestic purposes, is to be found in abundance. The sperm whale is fished near the Seychelles, and turtle abound. The working population, however, is scant, and during the last year two-thirds of the cloves which are produced by the remains of the spice gardens were left on the ground for want of labour to save them.

"This love of the ocean," says Mr. M'Leod, "might be turned to advantage by encouraging maritime pursuits and commercial relations between these islands, Madagascar, and the whole of the east seaboard of Africa." Specimens of cotton, woods for building purposes, orchilla weed, the COCO-DE-MER (found only on these islands), and specimens of the woods may be seen at the rooms of our Society, all brought home by the author of that Memoir from which I have extracted the preceding matter.

The same zealous officer wrote to me in 1857 from Mozambique, advocating the establishment of steam-postal communication between Aden, Natal, and the Cape of Good Hope. From England *viâ* Aden letters are delivered at Mauritius in 29 days. By the same route, *i.e.* by Aden, a letter might reach Natal in 25 days, and the Cape of Good Hope in 30 days, the steamer calling by the way at Zanzibar and Mozambique. Already it appears that endeavours are making at the Cape to carry out partially the suggestion of Mr. M'Leod by advertisements for tenders to carry on a monthly steam communication between the Cape and Mozambique, and between the former place and Natal steam vessels have plied once a fortnight for more than two years.

So rapid is the demand for advancement in these parts that the inhabitants of Natal and Mauritius contemplate the establishment of a telegraphic cable between these settlements.

Cotton.—In concluding the observations on Africa and the adjacent countries, I may not inappositely introduce a short notice of the countries from which we may expect to import cotton. The supply of cotton for our own manufactures is a subject which, in the course of the present year, has been frequently discussed at the meetings of the Society; and when I state that the yearly value of raw cotton consumed by our manufactures in 1857 was no less than 26,000,000*l.*, while the value of the fabrics which we exported, to say nothing of our own immense domestic consumption, amounted fully to 46,000,000*l.*, it is obvious that the importance of the question cannot easily be over-rated.

Besides British India, various other localities, including large tracts of Africa, have been pointed out as suited to the growth of cotton. In fact this plant has such a wide geographical extension, reaching to 35° north and south of the Equator, that it will thrive wherever it is not liable to be cut off by frost. It may be successfully cultivated for exportation wherever the soil is of adequate fertility, wherever the government is strong enough for the protection of life and property, wherever the country is not so crowded with inhabitants as to be itself the best market for its own produce (such being the case in China and the valley of the Ganges)—in short, wherever there exists a cheap transport to a foreign market, and, in so far as the finer qualities are concerned, wherever an adequate share of skill in culture and preparation prevails.

The southern States of the American Union are the parts of the world that have hitherto been found to possess in an eminent degree all the necessary qualifications now enumerated, and hence they are still the chief places from which we derive our finer varieties of the material. They do, in fact, yield 70 parts in 100 of the value of our whole consumption of cotton. Some parts only of our Indian dominions possess a few of the enumerated advantages, and they furnish us with about one-fourth in quantity and one-fifth in value of all that we consume; for the quality in this case, let it be observed, is the poorest of any that is found in our markets, and this simply from the absence of European care, which has never been exercised in the growth, curing, or inland transport of Indian cotton.

Many parts of Africa are, in so far as regards soil and climate, also obviously well adapted to the growth of cotton, which, if not an indigenous plant, has at all events been long acclimated. The Cotton-Supply Association, formed at Manchester, has not only been made up of those persons who look to a future increase of produce, but has been liberally supported by many philanthropists, who hope that the cultivation of the plant by the natives of Africa may produce a salutary change in putting an end to the slave-trade. One of the active supporters of this institution is Miss Burdett Coutts—a lady eminently distinguished by the kind, judicious, and practical application of her wealth. Among other efforts, this Association has caused a map on a large scale to be published, pointing out with much sagacity in colours the localities which appear, from fertility and means of transport, to be most eligible for the growth of cotton. Already a small supply of fair cotton has been brought to England from the Western Coast of Africa; and it is also asserted that the plant flourishes in abundance in the Fiji Islands.

Although it is not unlikely that Africa may hereafter supply our manufactures with a much larger amount of cotton than at present, the probability is that in such a country other articles better suited to the rude condition of the people will be preferred to it. We have a remarkable instance of this in the supply of the strong and useful oil which we import, the produce of a palm, Elais Guiniensis, a native of the Western Coast, and which, although the trade is of barely forty years' standing, we imported in 1857, as Mr. John Crawfurd informs me, to the extraordinary value of more than 1,800,000*l.* The same country is, without a doubt, well calculated to produce other oil-yielding vegetables like those we have been of late years receiving from India, such as linseed, rape, mustard, and sesame; all of them plants easily raised when compared with cotton. Already there has been imported from the Western Coast of Africa a still more valuable oil, which goes under the name of shea butter. This is the produce of one of the plants of the natural order Sapotaceæ, as is also the vegetable tallow which we have recently imported from the Malay Islands. The vegetable wax of Japan, of which, as already mentioned, a cargo has been imported within the last three weeks from that empire, is the produce of the Rhus succedaneum. I may add, that the voyagers up the Yang-tse-Keang have brought with them specimens of a more valuable article than any of these, insect-wax, the product of an insect which feeds and forms its nidus on a species of ash, *Fraxinus Hanburii.* This was obtained at the mart of Han-Kow, where it abounds, and is largely used in the manufacture of candles. It will be curious and instructive if we should find that as animal oils become scarce and dear in the progress of society, their place can be supplied from remote and opposite quarters of the world by oils derived from vegetables.

AMERICA.

British North America.—The important results of the exploring expedition under Captain J. Palliser, as communicated by the Colonial Office, and as dwelt upon in awarding the Founder's Gold Medal to that officer, have necessarily given great satisfaction to us, proceeding as they do from men who were especially recommended for this public service to Her Majesty's Government by our Society as well as by the Royal Society.

When Captain Palliser first proposed to make this exploration, one of the main points of interest to geographers was a survey of that part of the Rocky Mountains to the north of the United States boundary which separates the great tracts now named British Columbia from the eastern mass of British North America. Her Majesty's Government deemed it, however, of paramount importance that, in the first instance, the nature of the ground between Lakes Superior and Winnipeg should be accurately surveyed, in order to set at rest all questions of colonization as dependent on the possibility of making practicable routes of communication. For example, whether the Canadas might be brought into profitable communication with the Red River Settlement. The remoter or more western explorations were destined to develop the true nature of the great Prairie region, as watered by the North and South Saskatchewan rivers and their affluents. Collaterally, it was resolved, if possible—and mainly at the instance of this Society—to determine the elevation of the Rocky Mountains in those parallels of latitude, and to point out the passes in them by which communication might be opened out between the vast country occupied by the Hudson Bay Company and the great British seaboard on the Pacific.

In the award of the Patron's Medal to Captain Palliser, allusions have been made to some of the principal results obtained by the researches of the expedition under his orders. But I should not do justice to the leader and his associates, nor to my own feelings, were I not to add a few words of explanation and comment. The first year's labours were necessarily of more importance to the Government than they could be to geographers and naturalists. The great object was to determine the capability of establishing an intercourse between the rocky region of Lakes Superior and Winnipeg on the east and the rich prairie countries on the west; and though astronomical, physical, and magnetical observations of considerable importance were made—these countries being to a great extent known before, and their outlines being monotonous—that portion of the survey created but slight interest among us.

Not so when the Rocky Mountains, to which we had specially directed attention, came to be surveyed.* On proceeding from Fort Carlton, Palliser showed his good sense in approaching these mountains from the rich Buffalo prairies midway between the North and South Saskatchewan. An experienced buffalo-hunter himself, he knew that if his men were not well supplied, by no efforts, however well directed, could they succeed. Accordingly, having established a good base, and having secured abundant provisions at Slaughter Creek, he divided his force into three parties. Leading one of these himself across the Kananaski Pass, and returning by the Kutanie Pass in north latitude 49½°, and directing Captain Blakiston to explore the still more southerly or Boundary Pass, he sent Dr. Hector to traverse the chain by the Vermilion Pass, and to explore, as a geologist and naturalist, the much loftier mountains into which the chain rises in its trend to the N.N.W. This division of his forces well merited, therefore, the expressions used in the award which has been sanctioned by the Council.

The marked success of the survey accomplished by my young friend Dr. Hector has been peculiarly gratifying to me, inasmuch as I had answered for the capacity he would exhibit in applying his scientific knowledge. Thus, in addition to the determination of latitude, longitude, and the altitude of the mountains and two of their passes, Dr. Hector presents us with a sketch of the physical and geological structure of the chain, with its axis of slaty subcrystalline rocks, overlaid by limestones of Devonian and carboniferous age, and flanked on the eastern face by carboniferous sandstone, representing, probably, our own coal-fields, the whole followed by those cretaceous and tertiary deposits which constitute the subsoil of the vast and rich prairies watered by the North and South Saskatchewan and their affluents. His observations on the erratic or drift phenomena are also curious and valuable.

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* Dr. Hector had, by directions of his chief, made a successful foray in dog-sledges to the eastern edge of the Rocky Mountains during the winter, in which he procured men and horses.

Prevented by his instructions from descending into the valleys of the Columbia, and there to ascertain practicable routes to the far West, which he will look out for during the present summer, Dr. Hector, though so severely injured by the kick of a horse as to be incapacitated from moving for some days, contrived so to travel northwards as to round the base of the loftiest mountains of the chain before he returned to his winter-quarters in October, after an absence of eighteen weeks from his chief, but laden with valuable geographical and geological knowledge.

In this survey he had the merit of showing that the Vermilion Pass —which is less than 5000 feet high, and therefore 1000 feet lower than any other known pass of the Rocky Mountains—had another decided advantage over them, inasmuch as its western slope, from the summit level of the horse-path, is so little steep that its explorer has no doubt that even a road for carts may be there established. The descents westward, or into the drainage of the Columbia, in the other passes are exceedingly steep; and according to Captain Blakiston, the Kutanie Pass can only have a railroad made along it by the formation of tunnels of several miles in length, and by encountering the difficulty of the steep western gradient of 194 feet per mile.

Another singular natural feature of comparison is, that whilst the Vermilion Pass is less than 5000 feet above the sea, the adjacent mountains on the north rise to near 16,000 feet, showing the great depth of the gorge. On the other hand, in the range beyond the British boundary, to the south, and where no peak (not even that of Frémont) exceeds 13,000 feet, the passes range from 6000 to 7000 feet high.*

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* In anticipation of what may hereafter be published in the 'Journal of the Royal Geographical Society,' the reader is referred to the papers presented to Parliament in April, relative to the "Exploration by Captain Palliser of that portion of British North America which lies between the northern branch of the River Saskatchewan and the frontier of the United States, and between the Red River and Rocky Mountains." These printed documents are accompanied by a map, executed by Arrowsmith, from the surveys of the Palliser expedition, together with despatches of the leader and officers under his command, and tables giving the calculations of latitude and longitude by which the positions of places were fixed. An additional paper and map on the southern part of the Rocky Mountains near the American boundary, as prepared by Captain Blakiston, who had quitted the expedition, has very recently been sent to the Society, with the notice from the Secretary of the Colonies that it was not to be looked upon as an official communication until sanctioned by Captain Palliser. These last-mentioned documents, which seem to me to be also ably prepared, have not yet been laid before the Society. The public will soon possess an excellent map by Arrowsmith, in which all the new discoveries are inserted. This map is entitled 'The Provinces of British Columbia, Vancouver Island, with portions of the United States and Hudson Bay Territories.'

I was recently informed by my friend the Right Hon. Edward Ellice that the geographical

Whether one of the heights called Mounts Brown [*] and Hooker by Mr. Douglas, in honour of our eminent botanical contemporaries, be still higher than the Mount Murchison of Palliser and Hector, it is certain that the chain diminishes rapidly in its trend from this lofty cluster to the north. We know, indeed, that Mackenzie, the first great explorer of those regions, passed through the range in north latitude 56°, at a comparatively lower level. Again, we further know that in proceeding northwards these mountains dwindle into insignificance before they reach the Arctic Ocean.

It will be recollected that seven years ago Captain M. H. Synge of the Royal Engineers, who had been quartered in the Canadas and had made excursions into the adjacent western territories, being deeply imbued with the importance of the original observations of Mackenzie, and attracted by his glowing description, made a warm appeal in favour of the establishment of a line of communication between the Atlantic and Pacific, by passing from Lake Athabasca and the Peace River, thence traversing the Rocky Mountains on the parallel followed by Mackenzie. But that scheme must now, I apprehend, give way before the shorter passages across the mountains in a more southern parallel, and which will, it is hoped, bring a rich prairie country on the east into intercourse with our newly-discovered gold region on the west, as well as with Vancouver Island, the natural resources of which were brought before us by Colonel W. C. Grant.[†]

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position of these passes was laid down many years ago upon a MS. map, at the instance of the Hudson Bay Company, by Mr. David Thompson. I have further learnt from Mr. Arrowsmith, with whom he corresponded, that Mr. Thompson explored the vast regions of the Hudson Bay Company in all directions during twenty-eight years, and projected the construction of a general map of the whole country between Hudson Bay and Lake Superior on the east, and the Pacific on the west! It appears that the last six years of his labours were spent on the west side of the Rocky Mountains; it being important to note that his MS. maps were all made from actual survey, corrected by numerous astronomical observations. The largest affluent of the Fraser River in British Columbia, "the Thompson," justly bears the name of this great but little-known geographical explorer; and I therefore trust that there is no foundation for a report which has been spread, that it is proposed to substitute some other appellation for the name of this meritorious man. Beginning his astronomical observations in 1792, Mr. David Thompson was in 1817 appointed the Astronomer of the North American Boundary Commission, and was upwards of eighty years of age when he died in Canada. In the words of Mr. Arrowsmith, "he has left no one behind him who is possessed of a tenth part of his acquaintance with the territories of the Hudson Bay Company, whose directors were duly sensible of his great merits." Whatever may be the fate of that remarkable corporation, we must all admit that it has not only maintained British rights over wide tracts of North America, but has also, in addition to Thompson, produced some of the best geographical explorers of snow-clad Arctic countries, including our medallist Rae; whilst its dealings with the various fur-hunting tribes of Indians have been so equitable as to have maintained the attachment of those poor people, who under such influence have been preserved, instead of falling before the white man as in other parts of America.

[*] Mount Brown is said to be 16,000 feet high.

[†] *See* Journal of the Royal Geographical Society, vol. xxvii.

During the animated discussion which took place among us in the year 1851, Mr. Asa Whitney, of the United States, in proposing his gigantic plan of an inter-oceanic railway, candidly told us that the best line of intercourse between the two oceans would be found within the British territories, and the Palliser expedition has already gone far to demonstrate the truth and value of his suggestion.

With a knowledge of the data acquired by the Palliser expedition, men of ardent minds already contemplate the formation of a railroad, or, if not, of a practicable route, which, traversing British possessions only, shall connect the Atlantic and Pacific Oceans. But when we reflect that the length of this line is above 2000 English miles, and that the greater part of the route on the east will have to traverse wild and unpeopled regions, we cannot rush to hasty conclusions as to the practicability of such an enterprise. Neither ought we to deride a plan which may be ultimately called for when British Columbia and Vancouver Island shall have risen into that importance which they must attain as British colonies. For, it is now ascertained, that the tract lying between the North and South Saskatchewan on the east is one of great fertility, where no intense cold prevails, and that, once through the Rocky Mountains, the traveller enters a country of cedars and rich vegetation, in which even wheat may be grown at heights exceeding 2000 feet above the sea. In the mean time we need, at all events, have no hesitation in assuming that the electric telegraph will, ere long, be at work across British North America.

Believing it to be of the deepest geographical importance, that men who have so distinguished themselves as Palliser and his associates, should not, through a misplaced economy, be held to their original instructions, and be forced to return homewards by retracing their steps from Fort Edmonton, over the previously beaten tracts of North America and the United States, I have had great pleasure in supporting the request of the gallant leader of this expedition and of his associate Dr. Hector, that they might be allowed to wend their way home next summer by again traversing the passes in the Rocky Mountains, and thence to explore the great intervening tracts of British Columbia, including the auriferous region of Frazer River. I am happy to say that Sir Edward B. Lytton readily complied with this request, and that the Palliser expedition is thus about to establish fresh claims upon our approbation.

British Columbia.—Of the vast region to which our Sovereign recently attached the name of British Columbia, geographers have as yet but a scant and very imperfect account. Its first great explorer was my honoured countryman Mackenzie, who, traversing the Rocky Mountains, and reaching the sea after incredible labour, left us an excellent record of his exploits. Since that time agents of the Hudson Bay Company, including its Governor, Sir G. Simpson, have passed through this region; Mr. D. Thompson having partially surveyed it.

In our own volumes we find first, a slight sketch of the Columbia River, or notes made by Dr. Gardner at Vancouver Island and Fort William in the year 1835; then a few observations by Dr. Scouler on the indigenous tribes of the country, distinguishing the fish-eating and well-fed race of the coast from the hunters of the interior. In later years Mr. Douglas, one of the able men brought up by the Hudson Bay Company, and who has recently been appointed Governor of British Columbia, gave us the first sketch of the east side of the island discovered by Vancouver, and also of the Straits of Juan de Fuca; and Colonel Grant described that island much more in detail, giving also an account of its natural history and geological structure.[*] Then, again, the bold exploring botanist, the late D. Douglas, who fell a victim to his zeal, visited parts of the Rocky Mountains, collecting many fine plants, including the noble *Douglasia* pine, and assigning, as before said, the names of his eminent friends Brown and Hooker to the highest parts of that chain.

With the exception, however, of the description of Mackenzie,[†] we still remained very ignorant of the greater part of the region now known as British Columbia, and probably would have so remained many years longer, but for the accidental discovery of gold in the bed and on the banks of the Frazer River. So many diggers and speculators soon rushed to the tract, that it became necessary to raise the whole country into the rank of a colony, by separating it altogether from the influence of the Hudson Bay Company.

The printed papers communicated to Parliament in the last year, being accompanied by a map of the gold region, give us a fresh insight into the progress which has already been made in establishing this new colony. In these documents we are pleased to find, that whilst such clear and statesmanlike instructions have been forwarded by the Secretary for the Colonies, for the guidance of Governor Douglas, the latter has admirably fulfilled his duties in the management of a set of wild and untrammelled gold-diggers, chiefly wanderers from California, from whose lawless deeds and outrages he has taken the best measures to protect the poor Indians.

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[*] Whilst this Address is going through the press, a geological description of a part of Vancouver Island by Mr. Bauerman has been transmitted to me. It now appears that the *coal* before spoken of, like that of New Zealand, is *of tertiary age.*

[†] Avoch, the property and birthplace of Sir Alexander Mackenzie, who was knighted for his grand explorations in North America, like my own birthplace, Taradale, is in the Black Isle of Ross-shire.

A despatch to the Colonial Secretary from the Governor's Secretary of the Colony, Mr. F. W. Chesson,* after particularizing the character and habits of the Indians, eloquently and manfully points out the necessity of establishing a thorough British protection of these natives, and some reasonable adjustment of their claims, if the peace of the colony is to be maintained. "The present case (Mr. F. W. Chesson observes) resembles no common instance of white men encroaching on the lands or rights of aborigines for hunting or settlement. It more than realizes the fabulous feuds of Gryphons and Arimaspians, and no ordinary measures can be expected to overcome the difficulty which duty and interest require to be removed, if British Columbia is to become an honourable or advantageous portion of the British dominions." Advocating the adoption of a treaty between the British authorities and the chiefs and their people as legal, just, and pacific as that made by William Penn with the Indians of the eastern sea-bord of America, he rightly adds, that "Nothing short of realizing lawful payment of that which it may be necessary to acquire, and the proper administration of laws framed in a spirit of justice and equality, can really be of service."

Whilst the civil government is thus acting, it will, doubtless, be largely supported in its beneficent scope by the co-operation and aid of the mild influence of religious instruction. In addition to the efforts of the Society for the Propagation of the Gospel, it is, indeed, most gratifying to know that the benevolent Miss Burdett Coutts, who annually distributes aid with boundless liberality in fostering numberless charities and the spread of true religion, has furnished the means for the endowment of the bishopric of British Columbia; so that, thanks to the munificence of this good Englishwoman, the poor native Indians will find an instructor and protector in Bishop Hale.

Judging from the information already sent home, the gold region of the new colony presents a broad and general resemblance to that of California. Thus, as in the latter the ore has not yet been found in the coast-range which bounds the Pacific, but sets on at Fort Yale on the River Frazer, in long. 121¼°—extending northwards from 50° to beyond 51° North lat., the gold detritus has been found to ramify largely to the E. and N.E., along the various affluents of the Frazer; the Anderson, Thompson,* and various smaller streams, being found charged with golden débris. Specimens of gold from different parts of the region having been recently presented to the Museum of Practical Geology by Sir Edward Bulwer Lytton, I am led to infer that the original sites or quartz reefs in the slaty rocks, whence all this detrital matter has doubtless been derived, are ridges which lie in the N.N.W. prolongation of the auriferous ridges of California, and are separated from the Rocky Mountains on the east, and from the coast-ridges of the Pacific on the west. At present it is impossible to conjecture, with any approach to accuracy, what may be the probable length of this auriferous region; but there is every reason to think that it may extend far to the N.N.W.; so that the Emperor of Russia may possibly possess in his distant North American dominions a Dorado as well as in his own Ural Mountains. Again, even restricting our inquiry to the auriferous tract of British Columbia, we as yet know little or nothing of its breadth. It has been, indeed, said that gold has been detected on the eastern shore of the great Okanagan Lake, in E. long. 119°, a statement which seems by no means improbable, seeing that the precious metal has been found as far eastward in the United States as Fort Colville on the Columbia.

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* Parliamentary Papers relating to British Columbia, p. 59.

This brief allusion to the want of knowledge respecting the eastern extension of the gold fields of British Columbia may lead us to hope that Dr. Hector, the geologist and naturalist, who is even now about to traverse these tracts, will bring us home accounts which will, to a great extent, dispel our ignorance. He will, at all events, offer to us for the first time a true account of the lithological character of the Rocky Mountains, as distinguished from the auriferous chains on the West; and when his accounts are combined with those of Mr. Bauermann, the geologist of the Boundary Survey conducted by Colonel Hawkins, and these are co-ordinated with the data obtained by Palliser in more northern parallels, we shall, indeed, possess a valuable instalment of contributions towards a better acquaintance with a vast country which is, doubtlessly, destined to play a most important part in the annals of British history.*

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* The Duke of Newcastle, now Colonial Secretary, has just deposited in the Museum of Practical Geology a nugget from the *head waters* of the Thompson River, weighing nearly 8 oz.—*July* 12, 1859.

Arctic Researches.—It will be remembered that Captain M'Clintock failed to accomplish the middle passage across Baffin Bay in the season of 1857. The *Fox*, therefore, was forced to pass the winter in the pack, drifting with it helplessly to the south until set free in April of last year. No evil consequences beyond the irreparable loss of an entire year were experienced, the efficiency of the expedition being unimpaired, and after a short stay in the ports of Greenland, where supplies of fresh meat, &c., were obtained, as also from several vessels of the whaling fleet, Captain M'Clintock made a successful passage across the middle ice, and entered Pond Bay on the 29th of July. Our latest intelligence is dated from this inlet, whither he had gone for the purpose of investigating some very remarkable reports, which for the last few years have been perseveringly made by the natives to the whaling ships frequenting this quarter.

The statements made by the Esquimaux with respect to fugitive parties of white men in distress, point unequivocally to portions of the crew of the *Erebus* and *Terror*, and their conjecture is corroborated by the fact, that the sledges of these tribes are found to be constructed of oak and mahogany belonging to British ships, and by the existence of other articles in their possession, which could have been derived only from such a source. When last seen, the *Fox* was steering into the very centre of the area from which these reports proceeded, and to which Captain M'Clintock attached the utmost importance. Having cleared up this important point, it was his intention to proceed to Beechey Island to examine into the state of provisions there deposited, and then to make his way southerly towards the bight of the Back or Great Fish River, where it is earnestly hoped the object of his voyage will be attained.

Although it would be premature to express any immediate anxiety respecting the safety of this isolated vessel, commanded as she is by an officer of so much ability and experience, with so many depôts of provision to fall back upon in the event of any casualty occurring previous to her reaching the American continent, yet it cannot be denied that if the close of the present year should have brought us no intelligence, there will be grave cause for solicitude and for regret that Captain M'Clintock should have been left without that support from the west which I have invariably advocated.

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* An instructive map of the region lying immediately to the south of British Columbia, and extending southwards to California Proper, and which has been occupied and settled by the American Government, has been recently published by Mr. Trutch.

Even now we must deplore that the representations made to Her Majesty's Government to induce them to cooperate in this national undertaking by sending or by aiding to send a second vessel to meet the *Fox* through the route of Behring Strait, which was proved by Collinson to be so sure and safe for ships of any size, have not been attended to, and that the *Fox*, equipped and maintained as she is almost entirely at the expense of Lady Franklin, should have been permitted to go forth unaided on her holy errand. This consideration receives additional force from the fact that an Arctic vessel, especially presented by the United States Government, remains unemployed in our own waters; and when, in addition to the primary object of following up the traces of our missing countrymen, she could have been employed in making those magnetical observations on the north coast of the American continent, which the President and Council of the Royal Society have pointed out as being of great importance. Upon this subject it remains only to be remarked, that when Captain M'Clintock sailed from Aberdeen on the 30th of June, 1857, there was still a well-founded hope that the Government would make this concession in the interests of humanity and science, since there was ample time for the fitting out of a second ship before the month of December following, the season of departure for Behring Strait. In anticipation of such assistance, the far-sighted and experienced commander of the *Fox* communicated to Captain Maguire, whose knowledge of the western route rendered him peculiarly fitted to receive such confidence, the views he entertained as to the manner in which two ships, thus converging to the same specified field of search, might act in concert for the common object. It is painful to reflect upon what must be the feeling of disappointment of Captain M'Clintock, when, on reaching near to his goal, he finds none of those preconcerted marks or signals indicative of the approaching succour and cooperation of which he may stand in need.

While the spirit of Arctic enterprise seems almost to have departed from among us, our kindred nation on the opposite side of the Atlantic, entering upon it in the first instance with the kind feeling of succouring our missing countrymen, appear inclined to pursue a path from which so much honour has redounded, and we have received notices of their intention to equip from that country another expedition, having for its object the further examination of Smith

Sound. The settlement of that great physical question, the open Polar Sea, so desired by all geographers, will add a new lustre to the country that sent forth Dr. Kane. Those recent advices have also informed us that Mr. R. Kennicott, of Chicago, has started on a journey overland to the Arctic Ocean. He purposes to proceed to Fort Garry, on the Red River, and thence, with the agents of the Hudson Bay Company, to the valley of the Saskatchewan, the Athabasca, and the Peace Rivers, to the Great Slave Lake. Arriving at the Mackenzie River in the spring of 1860, the summer of that year he will devote to the exploration of the shores of the Arctic Ocean, returning home the following year. It is, therefore, not at all improbable that Captain M'Clintock, should God prosper him, may be welcomed to the shores of British America by a citizen of the United States![*]

Progress of Geography in the United States.—At our last Anniversary we justly awarded one of our Gold Medals to Professor Bache, for his highly important coast surveys; and I have now to advert to some other works of our kinsmen of the West that have come under my notice, and which reflect high credit upon them.

The large quarto publications which illustrate the tracks best suited for a railway between the Mississippi and the Pacific have now advanced to the eighth volume. This volume is occupied by a clear and able description, by Mr. Spencer F. Baird, of all the mammals, birds, reptiles, and fishes of those regions, preceded by a lucid introduction, the whole comprising 756 pages of letter-press and 40 plates. This publication and the volumes which preceded it have completely carried out the object of the American statesmen, who directed that their railroad surveys of unknown regions should be illustrated in so complete a manner.

In alluding to this Report, I must repeat what I have said on former occasions, in respect to analogous publications, that the

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[*] The last journals of Captain Fitzjames, the associate of Sir John Franklin, as addressed to Mrs. Coningham, which have just been printed by that lady's husband, Mr. William Coningham, M.P., are deeply interesting. The picture sketched by this gallant officer, of the perfect happiness and good order of the crews under the influence of their beloved commander, revives all our grief for the loss of such noble fellows. There is one expression (p. 8) which, had it been made known when the searching expeditions were sent out in quest of Franklin, might have saved some unnecessary orders of the Admiralty, and much fruitless speculation on the part of geographers, including myself, in favour of tentative efforts being made to the *north* of Beechey Island. "At dinner to-day (Captain Fitzjames writes) Sir John gave us a pleasant account of *his expectation of being able to get through the ice on the coast of America, and his disbelief in the idea that there is open sea to the northward.*" *See also* Sir John Richardson's able comments, article 'Polar Regions,' new edition 'Encyclopædia Britannica.'

Government of the United States has set an example which might certainly be imitated by the mother country. In treating of Australia, I have directed your attention to a proposal of the enlightened Governor of New South Wales, who has endeavoured to rouse the British Government to a sense of the importance of pursuing a similar conduct in our vast colonies.

In the first volume of this remarkable series of 'Explorations and Surveys for a Railroad Route from the Mississippi to the Pacific,' the reader will be much struck with the introductory State paper by Mr. Jefferson Davis, then Secretary of War, and addressed to the Speaker of the House of Representatives. The explorers are therein directed to observe and note all those objects and phenomena which have an immediate or remote bearing on the railway, or which might seem to develop the resources, peculiarities, and climate of the country. They were, in fact, ordered to determine all geographical positions, to lay down the topography of the lands, to observe the meteorology, including data for barometric profiles, and two of the party were to determine the direction and intensity of the magnetic force. Other individuals were ordered to make geological surveys and to collect all the plants and animals of the country, as well as to obtain the statistics of the tribes of aborigines. Now that these directions have been well and efficiently worked out by zealous and able men, let us render all honour to the nation which contributes such a great amount of fresh knowledge to the world of science.

Another of these very important documents recently issued by the American Government is the Report on the United States and Mexican Boundary Survey, by Major Emory and his assistants, whose descriptions of the natural appearances of the country are vivid, and its features pictorially delineated; the fossil remains having been collected and partially described by Mr. Parry. Besides many woodcuts representing various landscapes, the work is further embellished by a profusion of lithographic views, as well as by tinted and coloured sketches of the inhabitants. The geological description of the country was prepared by Mr. Arthur Schott, and specimens of the fossil remains having been brought to New York, have been described in this volume by the celebrated palæontologist Mr. James Hall. The accompanying map, embracing all the region included between the British boundary on the north and 23° north latitude on the south, and between 84° and 126° east longitude, is a great addition to our previous cartography.

In alluding to other works connected with the geography of America, I am glad to have the high authority of my friend Admiral FitzRoy for saying, that one of the most valuable meteorological works which has yet been produced is Lorin Blodget's 'Climatology of the United States.' This large octavo volume, amply illustrated with the best class of maps, is well written, and treats the subject in a masterly and comprehensive manner; the author having strictly followed Humboldt, and largely referred to Dové. In estimating such works as this, and the still more extensive Reports of Espy, we are reminded that they proceed from a country where one language, one system of measurement, one postal arrangement, and one government, coextend over a vast portion of the continent of America.*

If I were now presiding over my brother geologists, I might dilate upon the very important work recently published by Professor Henry Rogers on the 'Geology of Pennsylvania;' for truly the two thick quarto volumes replete with numerous illustrations which have been prepared by this geologist are to be viewed as masterpieces of correct delineation of the structure of his native country. Independently of the intrinsic value of these details to the geologist, miner, and proprietor, the maps and sections have in themselves a most important bearing on physical geography. In tracing the boundaries of the different geological formations, Professor Rogers has shown the intimate connexion between the complicated geological folds or replication and the geographical outlines of the land, and with an ability which proves him to be as good a physical geographer as he is an eminent geologist. Liberal as the State of Pennsylvania has been in contributing to the payment of the cost of this elaborate work, I happen to know that in addition to years of labour, the author has spent some of his private means in bringing it out; and I therefore sincerely hope, for the honour of science, that these volumes may meet with such a sale as will indemnify the writer, who has shown that he can combine such a profusion of details with broad and ingenious philosophical views.

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* Since this Address was read, I have had the satisfaction to receive from our associate, Commander Maury, the second volume of the eighth edition of his 'Explanations and Sailing Directions to accompany his Wind and Current Charts.' This invaluable work, which has justly acquired a world-wide reputation, is another of the striking proofs of the wisdom of the Government of the United States in their encouragement of science.

More recently our medallist, Professor Bache, has obligingly sent to me a list of all the principal American geographical explorations and publications since 1857. In addition to no less than thirty-nine such works, most of them executed by direction of the Government (and of which a list will be given in a subsequent number of the 'Proceedings'), Professor Bache informs me that the following four expeditions are either starting or are already in the field:—Exploration of the San Juan and Colorado Rivers, and of a route from New Mexico to Utah Territory, commanded by Captain John Macomb, Topographical Engineers U. S. A., under the Office of Explorations, War Department.—Exploration of the head Tributaries of the Yellow-stone and Missouri Rivers, and the region in which their sources lie, commanded by Captain W. F. Raynolds, Topographical Engineers U. S. A., under the Office of Explorations, War Department.—Construction of a Military Road from Fort Benton on the Missouri to Fort Walla Walla on the Columbia, commanded by Lieut. John Mullan, U. S. A., under the Office of Explorations, War Department.—Exploration of a route for a Railroad on a new line, across the Great Basin, by Captain J. H. Simpson, Topographical Engineers U. S. A., Utah Expedition, Brigadier-General Albert Johnston, U. S. A., commanding, under the War Department.

Many are the subjects connected with our science on which, in honour of the United States, I might expatiate. Even whilst I write, the newspapers of Boston announce the proposal to erect a vast Conservatory of Art and Science. Now, whether this idea be carried out in the public gardens of that city, or, as my illustrious friend Professor Agassiz wishes, in the precincts of the adjacent University of Cambridge, with which the names of Everett, Prescott, and other eminent men are associated, a subscription for that noble object, as furnished by thousands of citizens, is the best proof which can be afforded of an enlightened patriotism.*

Central America.—Every year brings us some new information regarding those portions of Central America which seem to offer the best lines for opening a direct communication, either by railroads or canals, between the Atlantic and Pacific Oceans.

The proposed railroad through Honduras has led to surveys across that territory, of very great interest in their actual as well as anticipated results. They will be invaluable to our mapmakers for the new data which they add to our geographical knowledge of a country never before so carefully explored. I have on previous occasions adverted to the mass of valuable information on Central America collected and published by Mr. Squier, the intelligent promoter of the Honduras Interoceanic Railway, which he has since followed up by further details, amongst others a corrected account of the great lake of Yojoa, which has recently been printed in the Proceedings of our Society.

M. Belly, who has obtained from the Governments of Nicaragua and Costa Rica the exclusive privilege and right to open an interoceanic communication, by water, through the territories of those states, has presented to me a copy of the map and sections of his proposed line, which have been laid before the Society. No one can doubt the great interest attached to such an undertaking; it remains, however, to be seen whether it is possible to raise the funds necessary for the completion of so gigantic an enterprise.

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* The great work of Agassiz, to the completion of which that eminent naturalist is devoting his life, and which has been subscribed for in the various States of America to the amount of 60,000*l.* sterling, is an additional proof of the encouragement of science in the United States.

South America.—In my Address of 1857 I noticed the preliminary account, all that had then appeared, of Lieutenant Page's 'Exploration and Survey of the Rio de la Plata and its Tributaries,' the full Report of which has now been published at the expense of the Government of the United States.

It forms an important contribution to the geography of South America, and may be well classed with the works of his brother-officers, Herndon, Gibbon, and Gilliss, whose travels were also undertaken under the liberal auspices and at the cost of the Government of the United States. The number of positions which have been for the first time determined and brought together by these officers will leave our mapmakers but little excuse for not correcting in the maps of South America the positions of many towns and places of importance, the true sites of which were never before, perhaps, fixed by observation.

The uninterrupted ascent of the Parana by an American steamer through 13 degrees of latitude as high as 19 degrees, fully corroborates the belief, founded on the old Spanish accounts, that the higher waters of this mighty river are navigable for vessels of quite as large a burthen as are requisite for carrying on a commercial intercourse with the rich provinces of Matto Grosso and Cuyaba, in the very heart of the continent. The observations, however, of Lieutenant Page (like those made in the case of the Yang-tse-Keang in China) show how little reliance is to be placed, even from year to year, on the most careful surveys and soundings of a great river liable to such alterations from periodical floodings. He says —"On comparing the charts of Captain Sullivan, made in 1847, with his own surveys made in 1853 and 1854, it appeared not only that the channels but the appearance of the river was in some places materially changed; islands have been enlarged, others reduced in size, some have disappeared altogether, and their positions as marked upon his chart are now, in some instances, the channel of the river." The track of the *Waterwitch*, at the lower pass of St. Juan (in lat. 30° 36′), passes directly over the position of an island marked on Sullivan's charts. This, as Lieutenant Page observes, proves nothing wrong in his surveys, but it is an interesting fact, showing the remarkable physical changes constantly produced by the action of the currents. The historical portion of Lieutenant Page's book has been drawn up apparently from the best authorities; the work of one of our former Vice-Presidents, Sir Woodbine Parish, having been amongst others very freely used.

I take this opportunity of recording with satisfaction that we have received a translation of Sir Woodbine Parish's work into Spanish, which has been published at Buenos Ayres, containing some later statistics and additional information respecting the interior provinces of La Plata, and collected by order of the local governments. This translation will add to the value of the work as the best book of reference on those countries.

West Indies.

Phosphatic Rocks of the Anguilla Islands.—A curious and important discovery has been made in the Anguilla Islands, which lie to the north of St. Kitts. The captain of an American trader being becalmed off a rock called "Sombrero," which lies between the British possessions of the Anguillas on the east and Anegada on the west, took away certain specimens of the rock, apparently a bone-breccia. On analysis, these proved to be richly impregnated with phosphate of lime, and a cargo subsequently imported was sold at New York at from 3*l.* 10*s.* to 6*l.* 10*s.* per ton, to renovate the worn out soils of Virginia.

Seeing that 30,000 tons of material removed from a little rock in the wide ocean, which no one had cared to claim, had realized 100,000*l.* in the New York market, the inhabitants of the Anguillas were led to believe that some of the detached rocks or "keys," which lie to the north of the chief island, and at no great distance from Sombrero, might be of the same composition as that rock. They accordingly induced the Governor of St. Kitts, Mr.[*] Hercules Robinson, to transmit specimens for analysis to London. These specimens having been sent to me by my eminent friend Sir William Hooker have been analysed in the laboratory of the School of Mines, and have been found to contain a notable quantity of phosphate of lime. Hence, when they are properly surveyed and opened out, there is every reason to hope, that these rocky islets will afford a supply of renovating material which may render the

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[*] Now Sir Hercules Robinson.—*June* 30, 1859.

British farmer, to a great extent, independent of the guano of Peru.*

Australia, Tasmania, and New Zealand.

Journey from Moreton Bay to South Australia.—The recent accessions to our knowledge respecting the interior of Australia have been large. Our medallist, Mr. Augustus Gregory, has performed a most remarkable inland journey from Moreton Bay, in which, though unsuccessful in discovering any relics of Leichhardt and his party (the first object of the expedition), he was enabled to define the nature of the interior of the continent from N.E. to S.W., and to reach Adelaide in South Australia. Taking a north-westerly course to the W.N.W. and N.W., he at first found abundance of green grass, though he fears that in seasons of drought few of the water-holes even at a moderate distance from the colony of Moreton Bay, recently named "Queen's-land," are permanent. Tabular sandstone ridges, basaltic peaks, or finely-timbered valleys succeed; but on passing from the River Nare to the N.N.W., it was found that the drought had been of such long continuance, that the whole of the vegetable surface had been swept away by the wind, leaving the country an absolute desert; a few widely-scattered tufts of grass being the only food discoverable for the support of the horses. When on the route to the N.W., which it is known that Leichhardt had intended to follow, Gregory found that high floods had obliterated all tracks of previous explorers, and that the very districts described by Mitchell as covered by a rich vegetation were parched and barren clays! In lat. 24° 55′, long. 146° 6′, a tree was, however, discovered, on which the letter L was cut, indicating very probably that Leichhardt had encamped there.

Continuing the search towards the north-west, Gregory then encountered tremendously heavy rains, and was entangled among numerous and deep channels and boggy gullies, from which the party was only extricated by extraordinary exertions. Such are the frightful vicissitudes abounding in this low region of alternate flood and drought which separates the fertile hilly country of the east coast from the great interior saline desert. In this region they met with occasional small parties of natives, who, as usual, were shy and treacherous, but easily intimidated. Despite of all impediments and much privation, the adventurers pushed on up Thompson River, through a desolate and arid, red-coloured, sandy country, until they reached lat. 23° 47′, when the total cessation of water and grass put an end to all efforts to penetrate farther to the north-west. Compelled, most unwillingly to abandon the principal object of their travels by continuing to follow the route probably taken by Leichhardt, Gregory and his companions then turned to the south-west, and ascertained the nature of the country between his remote position and Kennedy's farthest explorations, proceeding through more southern latitudes to reach the settled country of South Australia. The vicissitudes and privations experienced in this route to the south-east are succinctly related, and the outlines of ground, whether stony desert, plains with low ridges of red drift-sand, or sandstone table-lands, are well defined. Advancing by Cooper Creek, and that branch of it named by Sturt, Strzelecki Creek, the travellers finally reached Adelaide.

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* The richest of the specimens is from the rock or key called the Little Scrub. I have sent an account of these keys and a detailed analysis of the specimens, as prepared in the Government School of Mines, to the Royal Agricultural Society for publication in their volume, and have there expressed a hope that a geological surveyor may be sent to the Anguillas to define the extent and relations of these phosphatic rocks.

Respecting the fate of Leichhardt, Mr. A. Gregory thinks it probable that the adventurous traveller, advancing from the Victoria, was lured on to the north-west by favouring thunder-showers, until, on the cessation of the rains, he was arrested in the parched and waterless tract, and, unable to advance or retreat, he perished in the wilderness.* Gregory also informs us, that west of the meridian of 147° E. long. most of the country is unfit for occupation, until the boundary of the colony of South Australia, or 141° E. long., is reached in more southern parallels.

Our medallist is, indeed, well borne out in saying that the results of his expedition are most important with reference to the physical geography of Australia; for when combined with the researches of Sturt, they seem to demonstrate that, whether as examined from the north-east or south, a very large portion indeed of the interior is a worthless saline desert, very little above the level of the sea.

Explorations westward and north-westward from South Australia.—Whilst the last journey of Augustus Gregory has served to confirm the view established by the researches of Sturt, that a vast interior and sterile low region lies to the north of South Australia, and extends to the higher lands which form the western limits of New South Wales on the east, and to the elevations south of Cambridge Gulf on the north, the surveys set on foot at Adelaide have demonstrated that a vast tract of well-watered and fertile lands exists to the north-west of that colony.

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* My friend the Rev. W. C. Clarke has written able notices in the 'Sydney Morning Herald,' in which he differs in opinion from Mr. A. Gregory as to the track followed by Leichhardt.

The efforts of Mr. Herschel Babbage, to which I last year directed your attention, were for some time unsuccessful, owing to the intensely saline condition of the country through which he had to pass, and the difficulty of transporting the apparatus he had ingeniously contrived for the conversion of salt water into fresh. As soon, however, as the heavy teams and drays were dispensed with, and that, joined by Mr. C. Gregory, riding and pack-horses were substituted, this explorer showed how capable he was of defining with precision a considerable portion of new country in which fresh water was reached. Fixing with accuracy the latitude and longitude of several points, he proved the existence of dry land between the masses of water which had been previously united upon our maps under the name of Lake Torrens, while he defined their outlines, distinguishing the northernmost of them by the name of Lake Gregory.

Various other documents and sketch-maps relating to South Australia, which have been forwarded to the Society by Her Majesty's Colonial Secretary, demonstrate what vigorous exertions have been made by other explorers. Thus, Major Warburton defined large tracts of country north of the Gawler Ranges, *i. e.*, between Streaky Bay on the south-west, and the saline country occupied by Lake Gairdner and its adjacent lagoons. The larger part of this country seems to be incapable of supporting colonists, from the want of fresh water, and its prevalent saline character. This active officer also shows that, in many parts, the saline condition of the surface of the country is due to the existence of saliferous rocks beneath, being in this respect analogous to the saline steppes of Russia. Police trooper Geharty, in a separate tour, proved the extension of lands equally sterile with those explored by Major Warburton, which was to be expected, as the tract lies contiguous to the sterile coast-range of Eyre. To the east of Lakes Torrens and Gregory the explorations of Mr. Samuel Parry and Corporal Burt are worthy of notice; the former having determined several points of latitude and longitude, and having given us information respecting the nature of the rocks which occupy the region intermediate between Lake Torrens and Angopena, near the settled parts of the colony.

In the mean time, whilst Mr. Babbage was occupied with his earlier difficulties, and other explorers were determining the real condition of the saline tracts lying between 32° 30′ and 31° of latitude, an unaided colonist, Mr. M'Dougall Stuart, a former companion of Sturt, passed rapidly beyond all these saline tracts and discovered a large, well-watered, and more elevated region to the north-west. As soon as he ascertained the existence of a permanent supply of fresh water at Andamoka, in south latitude 30¼°, and had thus secured a retreat, he dashed on to the north and north-west, and soon fell in with numerous gum-creeks, containing streams which flowed from hills ranging from south-east to north-west, and further ascertained that large portions of this region were well grassed and admirably adapted for settlement!

The Governor of South Australia, Sir R. G. Macdonnell, states that the extent of this newly discovered available land amounts to from 1200 to 1800 square miles, and has rightly named the principal waterparting, Stuart Range. His Excellency then adds that the House of Assembly of South Australia had presented an address to him, requesting that the necessary steps should be taken for granting Mr. Stuart a fourteen years' lease of 1500 square miles of the new country.

When we look to the fact, that this explorer had, in the first instance, to get through the southern saline desert between the sea and those interior lands—that he was accompanied by one white man, Foster, and a black man only, and that his compass and watch were his only instruments, we cannot too highly applaud his success, and the Council of this Society has, therefore, well judged in awarding to him a gold watch in honour of such highly valuable discoveries.

Not only did Mr. M'Dougall Stuart define the northern portion of this new and fertile region, but before he returned by a most daring and perilous route to the coast on a meridian far to the west of his line of advance, he also ascertained the southern limit of all the available land.

Nothing which I have read of in Australian travel more strikingly displays the bold and undaunted spirit of adventure, than when Mr. Stuart had reached the southern limit of the fresh-watered country, and ascended a hill near Mount Espy to look southward over the country between him and the sea, he descried nothing but a vast saline desert through which (his provisions being almost exhausted) he must pass. Nothing daunted by that dismal prospect, or the great privations he would have to suffer, he regained the seashore, and travelling along it, once more found himself on the threshold of colonization. From the 7th of August, when he entered on this desert country, he and his companion Foster had to suffer from hunger and thirst during a fortnight before they reached the settlement of Mr. Gibson, in Streaky Bay. There, both the explorers nearly died, in consequence of the sudden change from a state of want to good diet. Recovering, however, they reached the regularly settled districts of the colony, and were hailed with acclamation in Adelaide.

Now, had the brave M'Dougall Stuart perished like Leichhardt in this last dreadful march to the sea-bord, all notion of a well-watered, rich interior country on the north-west might have been for ages unknown, and his success being ignored, his fate would have checked all further enterprise in that direction.

Whilst it is pleasing to reflect on this happy result, it is also well to know, that the newly discovered fertile lands may be approached from the settled and central portions of the colony without touching upon any part of the sterile saline coast-tract. For, as above said, it has been ascertained that the Lake Torrens of earlier days is divided into at least two bodies of water, and that the mass of land dividing them, which has since been traversed, may serve as the line of route to Stuart Range.

Through the researches of the Government surveyor, Mr. Samuel Parry, and of Corporal Burt, as well as by a return journey of Major Warburton, it has also been ascertained that practicable routes exist from Angepena, on the north-west of the settled country of Adelaide, to the region of Lake Torrens, by which (there being a sufficiency of water-holes) a communication may, it is hoped, be maintained between the settled districts and the new country.

At the same time this discovery of the local waterparting of Stuart Range must not be supposed to clash with the clear determinations of Sturt, that the great mass of the continent directly to the north of Victoria and South Australia is a vast saline depression. In fact the fresh waters descend from the Stuart Range on the north-east into that great sterile depression, and are there absorbed or evaporated. As far, therefore, as our present knowledge goes, we learn that the hilly grounds of Stuart Range, extending from south-east to north-west, constitute a zone of no great width, which pours off its waters both to the north-east and south-west into lower and saline deserts.

Navigation of the Murray, Murrumbidgee, &c.—Whilst such have been the discoveries of travellers overland, an object of paramount importance to Australia has been accomplished by water. The opening of the river Murray to navigation was first accomplished by Captain Francis Cadell, in 1853, as narrated by that enterprising seaman in a letter published in volume xxv. of our Journal. Steadily persevering, with augmented resources and additional steamers, the same individual and other parties have been recently plying on this river from its mouth, near Adelaide, in South Australia, to Albury, a distance of nearly 1800 miles. The channel of the Wakool has also been tested for 50 miles, and Captain Cadell has passed up the Murrumbidgee in a steamboat for 800 miles! Thus, a region in which six years ago no internal traffic existed, has been opened out to water carriage over a distance of 2650 miles, it being estimated that 1150 miles more may eventually be accomplished in the rivers Wakool, Edward, and Darling. The Murray and Murrumbidgee are now ascertained to be navigable from May to the end of December in every year, and for the whole twelve months in those years when more than the average amount of snow and rain falls in the Alpine country in which they take their rise. The Darling, not having its sources in mountains of such altitude, cannot be similarly reckoned upon, though probably it might also be rendered navigable in ordinary seasons if the drift timber, which at present encumbers it, were removed. Referring my readers to the clear and searching Report of a Committee on the navigation of the Murray and its affluents, printed by order of the Legislative Assembly of New South Wales (29th Oct., 1858), as signed by its chairman, that good explorer, Mr. George Macleay, and brought to my notice by my friend Mr. Stuart Donaldson, also one of the Committee,* it is enough for me to cull from that able document the astounding fact, that twenty towns, some of them of considerable size, such as Albury, Deniliquin, Gundagai, Tumut, and Wagga-Wagga, have been called into existence, and that seven more are about to be proclaimed. Already, 71,000 acres of land in this vicinity have been sold; and if, by Artesian borings, fresh water should be obtained in the vast salt-bush countries yet unoccupied, prodigious additional quantities of sheep and cattle may be supported in the adjacent regions.

Descending from the lofty Australian Alps of Strzelecki (Mount Koscinsko), the Murray traverses tracts, some of which, as well as portions of the basin of the Murrumbidgee, have been ascertained by my friend the Rev. J. M. Clarke to be highly auriferous, and in other respects also metalliferous. One of these gold tracts, Adelong, has indeed already been reached within 16 miles by one of the steamers. When we consider that this internal water carriage is already very serviceable for a vast distance to the colony of South Australia, in which the Murray debouches; that higher up the same stream is contiguous to the rich gold-bearing and rapidly rising tracts of the northern parts of Victoria; and that, out of the 1800 miles now proved to be navigable, 1300 lie within the territory of New South Wales, we must rejoice in the reflection that British industry and science have brought into activity a line of intercourse and traffic which must for ever unite in mutual interest the three largest of our Australian colonies.

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* Recently Minister of Finance of that colony.

Again requesting you to consult the well-considered and effective Report of the Committee, appointed by the Legislative Assembly of New South Wales, for the large and statesmanlike views which it embodies, I also specially commend to your notice the clear descriptions given in it by various colonists of the physical condition of the interior, the peculiarities and changes of the rivers, and the very ingenious and effective method employed by Captain Cadell of clearing away those masses of drift timber which formerly impeded navigation. Considerable additional expenditure will, indeed, be required to complete this grand operation of extracting the "snags;" but, looking to the spirit with which the Murray has been cleared for 700 miles, there can be little doubt of the ultimate result, and that in a few years, to use the words of the Committee, "the cheap transmission of the comforts and conveniences heretofore unattainable will give a fixed and civilized character to the society of vast pastoral districts, which has up to the present time been comparatively rude and nomadic."

New Zealand.—Among the good results of the scientific voyage round the world of the Austrian frigate *Novara*, under the command of Commodore Willenstorf, we have now before us a report of Dr. Hochstetter, the geologist of the party, on the coal of New Zealand. Although this coal is of tertiary age, as seen in the districts of Papakura and Drury, in the province of Auckland, it is stated to be abundant, and of such good quality as to be of great importance both for steam navigation and manufacturing purposes.*

As all the geological details will be laid before the Imperial and

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* *See* 'New Zealand Gazette,' January 1859, for the Report of Dr. Hochstetter communicated by the Governor, Thomas Gore Browne, and transmitted to the Royal Geographical Society by Sir E. B. Lytton.

Royal Geological Institute of Austria by my accomplished friend Dr. Hochstetter as soon as the men of science reach their native land, I rejoiced when I heard that the Emperor Louis Napoleon had given orders that the vessel freighted with such large collections and so much knowledge should not be interfered with by any French cruisers on her way home. I formerly spoke of my anticipations of the successful issue of this scientific voyage, and having recommended these Austrian explorers to the goodwill of Sir W. Denison, the Governor-General of East Australia, it was most satisfactory to learn that his Excellency had been enabled to assist them materially: whilst on their part they have well repaid the kindness shown to them by giving us the first reliable sketch which has been sent home of the true nature of the coal formations of New Zealand.

Tasmania.—Hitherto we have not yet been made sufficiently acquainted with the physical geography and natural history of this large colony. In former years, my valued friend the late Sir John Franklin, when Governor, strove hard to set on foot various scientific inquiries, and of late years the Tasmanian Society has published some good memoirs on various scientific subjects. Recently, however, the Local Government having resolved to have the whole island correctly surveyed by a competent geologist, Her Majesty's Secretary of the Colonies applied to me to recommend a proper person, and Mr. Charles Gould, formerly a distinguished student of the Government School of Mines, has, in consequence, been appointed geological surveyor of this important and little explored region. Whether we look to the correct delineation of the coal deposits which are already known to exist there, to the discovery of gold, or to the general advancement of science, I feel certain that the researches of Mr. C. Gould (son of the eminent ornithologist) will prove of signal value to the colony, and be well appreciated in the mother country.

General Observations on the Australian Colonies.—A project for the establishment of a system of observation in various branches of natural history sciences throughout the British Colonies, and of publishing the same, has been transmitted by the enlightened Governor-General of New South Wales to Her Majesty's Secretary for the Colonies, who has submitted the plan to the consideration of the Council of this Society.*

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* The project has been also submitted to the President and Council of the Royal Society, who, as well as the Council of the Royal Geographical Society and myself, have reported favourably upon the scheme.—*July* 1, 1859.

Being much impressed with the value of the publications on the structure and natural history of the several states of North America, and particularly by a work in 22 volumes on the State of Chile, of which 16 are devoted to the zoology and botany of that country (the portion on geology being still in progress), Sir William Denison has suggested that works on a similar plan, descriptive of the natural history of the British colonial empire, should be set on foot.

Agreeing with Sir W. Denison that such an undertaking is well worthy of the nation whose offshoots have taken root so extensively, I trust that due encouragement will be given to the proposal, and that it may not be checked by the difficulties which at first sight present themselves in bringing it into an effective working state. Sir William feels certain that the different colonies, if called upon, would gladly contribute largely to the work, whilst he looks to the Imperial Government to take upon itself the task of arranging and publishing these contributions upon one uniform system.

The practicability of realizing some such plan as this for our Australian colonies, is illustrated in part by the mode of publication proposed of the geological survey of Trinidad and other West India Islands, to which I have alluded. Works like these, the cost of which is to be divided between the colony and the mother country, must tend to unite by closer bonds all parts of our empire. The practical difficulties will lie first in the selection of persons competent to execute the task, and, next, to organise such a home staff as may efficiently carry the publications through the press.

In reference to Australia, it may indeed be said that parts of the scheme of Sir W. Denison are already advanced. Thus, it is certain that there are few animals or plants of New South Wales which are not known to the eminent naturalists Mr. W. Macleay, and Dr. John Bennett, who reside at Sydney; whilst the geology of large tracts has been accurately laid down since those days when Strzelecki first opened out to us its structure, by Clarke, Jukes, Stuchbury, and others.

Again, from Victoria, now under the enlightened auspices of Sir H. Barkly, we are constantly receiving proofs of the zeal and ability with which Mr. A. Selwyn is describing and laying down accurately upon maps the geological features of that rich auriferous region; whilst Dr. Mueller, on whose shoulders as an Australian botanist has fallen the mantle of Robert Brown, is continually issuing new works on the plants of the continent, whether those which he collected in tropical or northern Australia, when he was the companion of Gregory, or those of Victoria.

These, then, are excellent materials, ready to be used in the publication of the Opus Magnum of our colonial empire which is projected by Sir W. Denison. Let us hope, therefore, that the Old Country may willingly respond to this demand for knowledge made by her children in the colonies. Let us follow the admirable example in this respect set to us by our kinsmen in the United States as well as by our fellow countrymen in Canada, where the publications on geography and geology have already demonstrated how much can be done by the hearty goodwill of the several states of the American Union and by one great colony of the British empire.

Before, however, I quit the consideration of Australia and the adjacent lands, let me remind you of the endeavour which I made as early as the year 1844 (see Address, vol. xiv. p. xcvii) to rouse the attention of the public to the necessity of keeping up the establishment we then possessed at Port Essington, whether as a port of refuge for our merchantmen in peace, or as a roadstead during war, in which a fleet could assemble, to protect the northern and eastern coasts of this vast continent. In the absence of such, it was clear that an enemy might sweep the eastern archipelago on the one side, or attack the slightly protected colony of New South Wales on the other.

In the mean time, although we have long ago abandoned the solitary station of Port Essington on the north coast of Australia—contrary to the entreaty of that excellent naval officer the late Sir Gordon Bremer and his associates now living, Captains Stokes and Drury, as well as in the face of a protest on the part of this Society—not only has no substitute for it been obtained by occupying Cape York or any other station, but we seem to have been heedless of the efforts made in the interim by the French to establish other ports in these seas, and to fill them with a naval force. Thus, whilst the picture of New Caledonia, as discovered by Captain Cook, still hangs in the rooms of the First Lord of our Admiralty, that great island has been taken possession of by the French, and is now their "Nouvelle Calédonie." Now, if our allies (and may they long continue such) were merely occupying these islands for purposes of trade and commerce, little notice might be taken of the event; but when it is known that they possess in those seas and bays a much larger force of ships of war than Britain, the prospect is, I am bound to say, most unsatisfactory as regards the long undefended coast-line of Eastern and Southern Australia.

In vain has your old President insisted on this point for many years, in virtue of the advice of naval officers of experience in those seas, on whose opinion he could rely; but he trusts that a sufficient naval protection of Australia—no less than of the British isles—will now seriously occupy the attention of the Government, the Parliament, and the country.

CONCLUSION.

Entreating your pardon, Gentlemen, for the many imperfections in the preceding sketch of the progress of geographical science during the past year, I will now conclude with a few general remarks connected with the immediate interests of the body over which I have the honour to preside.

Our twenty-eighth volume, shortly to be issued, contains memoirs of high interest, which will fully sustain the reputation we had acquired; and our Proceedings, containing records of the conversations which followed the reading of the various memoirs, have in the mean time put our absent and travelling associates in possession of the zest with which our affairs are carried on.

Whilst a true "*esprit du corps*" has animated us on all occasions, never did it shine forth in a manner so congenial to my feelings as when the mass of the Society rose to bid farewell to my dear friend Livingstone, and at a few days' notice filled to repletion the largest festive hall of this metropolis to wish all success to the undaunted traveller who was about to reexplore the interior of South Africa.

So steadily have our numbers augmented, that although the Society seemed to have reached its climax last year, when I spoke of its having rapidly increased from 600 to nearly 1100 members, I have now the happiness to know that it actually possesses 1200 members, a number far exceeding that of any other scientific body in London.

Looking to the composition of this body, I rejoice to observe that it is made up of men of so influential and yet of such very different classes and walks in life as to ensure a long continuation of prosperity. In addition to the efforts of geographers, including eminent astronomers and physical philosophers, as well as ardent explorers of distant lands, this Association also flourishes through the good will and hearty support of statesmen, members of both Houses of Parliament, officers of the army and navy, residents in our colonies, and the merchant-traders of this great metropolis. All these, as well as many proprietors and professional gentlemen, take a deep interest in our progress, because they see and feel that in the diffusion of fresh knowledge, and in grappling with questions of physical geography, natural history, and the productions of distant countries, we are continually advancing the material interests of the nation.

It is for such reasons that the Secretaries of the Foreign and Colonial Departments, as well as the Board of Admiralty, never fail to supply us with materials which sustain the interest and character of our evening meetings.

Considering that a larger number of votaries attend these assemblies than those of any other scientific Society, the only drawback which seems to weigh upon us at the present moment is the difficulty of obtaining a meeting-room capacious enough to receive our great numbers. For the last two years the Council of the Royal Society and the Senate of the University of London have kindly permitted us to hold our meetings in the great hall at Burlington House: but if that room and all the beautiful adjacent buildings are to be removed in order to give place to colossal edifices, in which the cultivators of art and science are to have their meeting-places, galleries, and museums, let us confidently hope that a Society so useful and so popular as our own will receive some share of the patronage of the Government.

Let my associates be assured that their President has been quite awake on a subject so important to their interests. Ample care has been taken that the Council should not lose a moment in memorializing the Government and in strongly urging our just claims; but up to the present time no assurance has been obtained that we shall be provided with apartments on the site of Burlington House, and thus be affiliated, as I ardently wished, with the Royal, Chemical, Linnean, and Geological Societies.*

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* In issuing this Address I have the satisfaction to announce that the President and Council of the Royal Society have, on my application, consented to continue to the Royal Geographical Society the use of the Great Hall in Burlington House for the meetings of the coming Session.—*July 15.*

I must here express my sincere satisfaction, that one of the results to which I have looked with deep interest for many years has been attained since I last addressed you. We have obtained a Royal Charter, which secures to us all those claims upon the State to which our works had already well entitled us; and, as we are now placed in precisely the same public condition as any of the older scientific Societies of the metropolis, it enables me with truth to take leave of my dear friends, as the really good "Fellows of the Royal Geographical Society." The use of my name as your President in this Royal Charter will indeed be to me a source of pleasing reflection through life, whilst it will acquaint those who follow us that I have been bound up with your rise and progress.

Lastly, as the moment has now arrived when, in accordance with our rules, it is my duty to bid you farewell in the capacity of President, let me assure you that I should do so with infinite pain, if the act were to be accompanied by any severance of those ties of reciprocal esteem and affection which I am proud to say have united us in close relationship during many years. Believe me, that in whatever post I may be placed, my heart is too firmly fixed in the prosperity of this Society not to strain every nerve to aid its advancement. I shall, indeed, ever look back with the truest satisfaction to the happy days I have passed among you, and shall never cease to be grateful for the warm support you have invariably afforded me when occupying this chair; thus securing that unanimity and cordiality with which we have all pulled together.

As our meetings are now so numerously attended, and partake so essentially of a popular character, I deem it most fortunate that at this stage of our progress we have been enabled to secure the services of the Earl of Ripon, the son of our first President, who, inheriting the engaging manners and enlightened purposes of his parent, has already shown, both in the Senate and amid large bodies of his countrymen, that he possesses all the qualities which will enable him to maintain our Society in harmonious action. At the same time I also feel confident, that with his attainments and liberal views, he will essentially promote the higher objects of our science.

In handing over to his care the interests of a body so dear to me, you must permit me to say, that as every Roman citizen who had more than once served as Consul was assured that a notice of this honour would be inscribed upon his monument, so do I hope, that those who survive me will not fail to have engraved on my tombstone the record of which I may well be proud—that by the goodwill of my associates I served for twenty-seven years as a Member of their Council, and was during seven of those years the President of the Royal Geographical Society.

PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

SESSION 1858–9.

Thirteenth Meeting, June 13th, 1859.

THE EARL OF RIPON, PRESIDENT, in the Chair.

ELECTIONS.—*Captain Richard F. Burton (Bombay Army); Lieutenant-General Peter De la Motte,* C.B.; *Professor Hind (of Canada); Captain W. Fraser Tytler; John F. Bateman,* C.E.; *A. Benson Dickson; Christian Hellmann; Henry Johnson; Coleridge J. Kennard; Daniel A. Lange; Walter D. Leslie; F. Butler Montgomerie; W. Moon; Stephen W. Silver; and Edward W. Stafford, Esqrs.; were elected Fellows.*

EXHIBITIONS.—Specimens of the weapons, manufactures, and natural productions brought by Captains Burton and Speke from Eastern Africa, and of woods from the Zambesi brought home by J. Lyons M'Leod, Esq., F.R.G.S., late Consul at Mozambique; also several maps of the seat of war in Italy, &c., were exhibited.

The PRESIDENT.—Ladies and Gentlemen: I understand that it is not the custom on these occasions to offer any general observations, except such as may be connected with the Papers immediately in hand, otherwise I should have felt it my duty to express my thanks to you at greater length than I shall now do, because I am most anxious to preserve intact the ancient practices of this Society. I should have felt it my duty to express my warmest thanks to the Fellows of the Royal Geographical Society for placing me in this Chair. But I apprehend a more fitting opportunity for so doing will be afforded me on a future occasion, of which I shall most gladly avail myself. It will, therefore, be hardly necessary that I should detain you a minute from listening to the Papers which will be read on that most interesting expedition, the exploration of Central Africa, by Captains Burton and Speke. Their steps during that arduous undertaking have been watched with interest by every person in this country attached to geographical science, and every Fellow of this Society is aware of the importance of the inquiries which they went out to institute. What we shall hear from them will give us an idea of the difficulties, disasters, and privations they endured, and I think we shall be able to draw from their narratives—though they will not dwell on it themselves—with how much spirit, courage, English pluck, and enterprise, they overcame those difficulties. Captain Speke, who penetrated in a different direction somewhat farther than Captain Burton, who was prevented by illness from following him, is decidedly of opinion that he has established the point whence the Nile takes its rise.

You will hear what he has to say on this subject, and no doubt there will be some discussion upon it afterwards; but I feel quite convinced that whatever differences of opinion may arise on that particular point, though I think the arguments which Captain Speke adduces are of very great weight and importance, every one who hears the accounts to-night will feel that most valuable and important information has been obtained—information not only important in a geographical point of view, but valuable also as having no small bearing on commercial and industrial questions. I think we should never lose sight of the importance which the labours of this Society possess in respect of the industry, manufactures, and commerce of this country. I will not detain you any longer from the extremely interesting narrative of Captain Burton, who will now proceed to read his Paper.

The Papers read were—

Explorations in Eastern Africa. By CAPTAINS R. F. BURTON, F.R.G.S., and J. H. SPEKE, F.R.G.S.

1. CAPTAIN BURTON, late Commandant of the East African Expedition, read out a general account of his proceedings subsequent to the tentative journey to Fuga and Usumbara, which appeared in the 28th Vol. of the Journal of the Society.

The Paper contained a description of the personnel of the East African Expedition when leaving the coast for the purpose of exploring the "Sea of Ujiji." The difficulties of departure and the severe trials of patience on the road were then dwelt upon. At length, however, the travellers reached Unyanyembe, the capital of the "Land of the Moon," and experienced from the kindhearted Arabs the warmest welcome, for which, however, they were not a little indebted to the introductory firman furnished by H.H. Sayyid Majid, Sultan of Zanzibar and the Sawahil. Captain Burton then briefly described the trying and dangerous march during the rainy monsoon from Unyanyembe to Ujiji upon the Tanganyika Lake, and his exploration in company with Captain Speke of the northern waters of that sweet sea, which saw for the first time the union jack floating over its dark bosom. Want of supplies prevented the travellers penetrating farther into the interior, and concluding the Periplus of the Lake; they reluctantly bade adieu to Ujiji, and on the 10th of June, 1858, re-entered Unyanyembe.

After about six weeks, during which Captain Speke, having traversed the unexplored length of Usukuma, laid down the southern limit of the Nyanza or Ukerewe Lake, which had been heard of from the Arabs of Unyanyembe, the expedition marched eastward, intending to make the coast *viâ* Kilwa. Again, however, they were doomed to disappointment. The African Pagazi, or porters, could not be persuaded to deviate from their normal line. The explorers were not less determined, and the consequence was that they were abandoned by their men *en masse*. The necessity of awaiting the arrival of some down-caravan that would convey their collections to the coast delayed them for some time at Zungomero, a province lying at the foot of the East African Ghauts, known by the name of Usagara. They did not arrive before early in February, 1859, after a journey of four months from Unyanyembe, at the little maritime village of Konduchi. There they dismissed their guides, porters, and Beloch guard: and having been supplied from Zanzibar, by Captain C. P. Rigby, H.B.M.'s Consul, with stores and a Battela or native craft, they sailed for Kilwa (Quiloa) with the intention of exploring the yet unvisited Delta of the Great Rufiji River. Once more they were thwarted by circumstances. The cholera, which had travelled slowly down the eastern coast of Arabia and Africa, had committed such ravages at Kilwa that the people stunned by their imminent danger would offer no assistance. In the short space of three days the travellers lost half their crew, and of their private servants one died and a second was rendered useless. After a cruize to Kilwa Kisiwani, or the ancient settlement upon Kilwa island, they returned to the mouth of the Rufiji, found the stream in flood, and were soon made aware of the fact that the Hindi traders would, unless controlled by an especial firman from Zanzibar, oppose indirectly, by means of the savage tribes on the river-banks, an exploration of the rich and copal-bearing lands lying along its course. The rainy monsoon being imminent, and scant prospects of overcoming the scruples of the Banyans presenting themselves, the travellers turned the head of their Battela northward, and on the 4th of March, 1859, landed, after an absence of nineteen months, upon the island of Zanzibar.

The Paper concluded with an allusion to the political difficulties which have beset the little state since the division of property consequent upon the decease, in 1857, of our old and valued ally H.H. Sayyid Said, popularly known as the Imaum of Muscat. He had bequeathed his Arabian territories to his eldest son Sayyid Suwayni, and the island of Zanzibar and that portion of the East African coast which has acquired the name of "Sawahil" or "the shores" to a cadet, Sayyid Majid. The former prince, under pretext of recovering a subsidy or tribute from his younger brother, had prepared a semi-piratical expedition, with which he threatened the coast and island of Zanzibar. The report spread terror among the wealthy Arab clove-growers, and the European houses established in the island suffered severely from stagnation of business; the representatives of the different governments were divided in opinion concerning the justice of the claim: the slaves were all armed, and the town of Zanzibar was thrown into a state of excitement and suspense. After a fortnight of confusion, it was officially reported that H.B.M.'s steamer *Punjaub*, under orders from H.E. the Governor of Bombay, had met Sayyid Suwayni's fleet off the eastern coast of Arabia and had persuaded it to return.

After a courteous dismissal on the part of H.H. Sayyid Majid, to whom the travellers had every reason to be grateful, Captains Burton and Speke bade farewell to Zanzibar. Having engaged a passage in a clipper-built barque, the *Dragon of Salem*, they quitted East Africa on the 22nd of March, and arrived at Aden in the middle of April, 1859. Their explorations, dating from the time of their leaving Bombay, had been carried on for two years and about three months; and their discoveries will appear in detail at a future time in the Journal of the Society.—R. F. B.

The PRESIDENT.—As the two Papers are intimately connected with each other, I will call upon Captain Speke before inviting discussion on the Paper you have just heard.

2. THE region traversed by Captain Burton and myself is divisible into five bands. They all run parallel to the coast, and each of them is characterised by special geographical features. The first is the low land between the coast range and the sea. Its breadth is about 120 miles, and its average slope not more than 2 feet per mile. Forests of gigantic trees, and tall grasses, cover its surface. The second band is the coast range of mountains. These are hills in lines and in masses, intersected by valleys, through which the rivers of the east coast find their way. This range is easily crossed, and nowhere exceeded 6000 feet, adjacent to the line of road taken by our travellers. It is capable of cultivation, though neglected, because the slaving forays to which it is subjected drive away the inhabitants. The third band reaches to Unyanyembe. It is a dry plateau, with a slight inclination toward the interior, and ranging in height between 3000 and 4400 feet. Tributary streams, running southwards to the Ruaha, intersect it. The fourth zone is a continuation of the above, but it is better watered, and is studded with granite hills. Here is the water-parting between the streams that run eastward to the Indian Ocean, and westward to the Tanganyika Lake. The Nyanza Lake is situated in this band. The fifth band is a remarkable slope, that inclines to the shores of the Tanganyika. It sinks no less than 1800 feet in 45 miles; it is exceedingly fertile, but harassed by marauders of the Watuta tribe.

On arriving at Ujiji, the party found that the only boats to be had were wretched canoes; while the troubled state of the country rendered it unsafe to explore the lake unaccompanied by a large escort. There was, however, a small sailing craft belonging to an Arab, on the other side of the lake, which would be large enough to contain the entire party; and Captain Speke started with seventeen savages, as a crew, and four of his own men, to hire her. He first coasted to Kabogo, a bold promontory usually selected as the starting point, when the lake has to be crossed, and reached it in five days. He describes the shore as wild and beautiful, affording many convenient harbours, and requiring but a little art to make it quite a fairy abode. There were no inhabitants, but an abundance of game,—hippopotami, buffaloes, elephants, antelopes, and crocodiles. The passage across the lake, a distance of 26 miles, was made rapidly and safely, and Captain Speke was cordially welcomed by the Sultan of the country on the opposite side. The owner of the sailing boat was there also, and was ready to afford every assistance; but he himself was on the point of starting on an ivory expedition 100 miles into the interior, and the crew of his sailing boat were, at the same time, his armed escort; he could not therefore spare them. What made the disappointment doubly vexatious, was that this Arab desired Captain Speke's companionship in his intended journey, and he promised the boat on his return. Had Captain Speke been unfettered by time, this would have been an excellent opportunity of farther travel. As it was, he was obliged to go back to Ujiji without the sailing boat, and proceeded with Captain Burton to a more extended exploration of the Tanganyika Lake, which lasted a whole month. The mapping of its southern portion depends on information given by this Arab.

On returning to Unyanyembe, Captain Burton's continued illness again made it necessary for Captain Speke to proceed alone to the northward to explore the Lake Nyanza. He went with 33 men, through a line of populous country, less visited by strangers than that which he had hitherto travelled on. There were numerous petty sovereigns who were hospitable enough, but very troublesome. The view of Lake Nyanza, with its numerous islands, reminded Captain Speke of the Greek archipelago. The islands were precisely like the tops of the same hills that studded the plains he had just travelled over. In fact, the lake had the features of a flooded country rather than those of a sheet of permanent water, with well marked banks. Its water is sweet and good: those who live near it drink no other.

Captain Speke's explorations did not extend beyond its southern shores. The more northern part of his map is based on native information, especially on that of a very intelligent Arab, whom he had previously met with in Unyanyembe, and whose data, so far as the shores of the lake, were found by Captain Speke to be remarkably correct. This Arab had travelled far along its western shores. In 35 long marches he reached the Kitangura river, and in 20 more marches, Kibuga, the capital of a native despot. Between these two places he crossed about 180 rivers, of which the Kitangura and the Katanga were the largest. The former is crossed in large canoes; the latter, though much larger and broader, is crossed during the dry season by walking over lily leaves; but in the wet season it spreads out to an enormous size, and is quite unmanageable. The rainy season is very severe in these parts. No merchants have gone farther than Kibuga; but, at that place, they hear reports of a large and distant river, the Kivira, upon the banks of which the Bari people live. This river is believed by Captain Speke to be the White Nile.

THE PRESIDENT.—Gentlemen, I am sure you will agree with me that the Papers we have just heard are full of the greatest possible interest. The country which has been explored by Captains Burton and Speke is a most important one in a geographical point of view, being connected with what I trust may be ultimately established to be the solution of that most ancient problem of the sources of the Nile. The arguments adduced by Captain Speke, I think all will admit, are of very great weight, although probably some gentlemen here may be inclined to question them. No doubt his conclusion cannot be taken as absolutely established until farther explorations have been made, which I hope will be carried on under the same excellent explorers: and I trust such fresh discoveries will bring forward complete evidence of the fact, or rather support that which is now only a matter of opinion. This, at least, is clear. These gentlemen have obtained for this country the great scientific honour of having been the first to explore these regions, and they have also been the means of clearing up many questions relating to lakes and mountains in that district about which there has been a large amount of controversy hitherto. So important a subject as this certainly invites discussion, and I will, therefore, take this opportunity of requesting Sir Roderick Murchison to give us his opinion upon the Papers which have been read. It will be in the recollection of most present that Sir Roderick had a great deal to do with the origin and fitting out of this expedition—one of the most important, I think, ever conducted under the auspices of the Royal Geographical Society, and I am sure it is most fitting that he should open this discussion.

SIR RODERICK MURCHISON, V.P.R.G.S., etc.—My Lord; In the first place allow me to congratulate your Lordship on occupying the Chair which I have recently vacated, upon the occasion of the reading of a Paper of as great importance as any that has been communicated to this Society since Dr. Livingstone emerged from Africa, and described the southern portion of the continent from shore to shore. It is only necessary to point to the two large maps before you to see what Captains Burton and Speke accomplished. There *was* our knowledge (pointing to the old map) a year ago—there *is* our knowledge now (pointing to the new map). They have, by means of astronomical observations, fixed the position, the longitude and latitude of these two great lakes, and have shown you that whilst one is like other lakes, of which we had previously heard, situated on a great plateau, the other is situated at such an elevation that, as Captain Speke has explained to you, it may very possibly be found to feed the chief sources of the Nile. I will not now argue that difficult question, because I am quite sure there is one gentleman here, if not others, who may dispute that inference. I will, therefore, first call attention generally to the great importance of these discoveries. My friends here have not only traversed the district and furnished us with a good picture of the manners and customs of the inhabitants, but have also brought home rock specimens which enlighten us as to the fundamental features of this country; and to these rocks I will for a moment advert. Captain Burton placed before me this morning certain specimens which show me that at an elevation of upwards of 3000 feet above the sea and towards the interior there are fossilized land shells, showing that from very ancient periods the lands have maintained their present configuration. These deposits, whether purely terrestrial or lacustrine, have been consolidated into stone, and show that the existing internal condition of Africa is that of ages long gone by, as I took the liberty of pointing out to the Society some years ago, when treating of Livingstone's first explorations. Another striking feature in connection with this great zone of country is this. You will observe that our friends spoke of remarkable herds of oxen on the banks of the lake Tanganyika, and tribes of people between that vast lake and the coast range, who are a thriving, peaceful, agricultural population, whilst the adjacent districts in the north and south are frequently disturbed by wars for slave-hunting purposes. This is a great fact as indicating a broad line of route by which we may hope hereafter to establish intercourse with the interior country. There is another important fact, though I do not think Captain Speke alluded to it, namely, the absence of that great scourge of parts of Southern Africa, the *Tsetse* fly. With regard to the physical geography of the country, it is remarkable that all the adjacent rivers fall into the great Tanganyika lake, which was formerly supposed, on the contrary, to afford the sources of the Zambesi river. All theory, therefore, on this subject is now set at rest. Lastly, we come to the subject which is likely, as I said, to give rise to much discussion, and that is the theory upon which I think my friend Captain Speke may rest his claim to our most decided approbation. On my own part I am disposed to think that he has indicated the true southernmost source of the Nile. Now, in saying this I do not mean to deny that the great mountains flanking the lake on the *east*, of which a point or two only is marked on the map before us, do not afford the streams which flow into this great lake. That must probably be the case on the east, just as Captain Speke ascertained from the Arabs that the so-called "Mountains of the Moon" feed the same lake from the west by other streams. You must here recollect that the same Arab sheik who gave him the information which turned out to be correct concerning the existence of the lake Tanganyika also told him of the existence of the Nyanza, which lake was found to be exactly in the position indicated. As Captain Speke has determined that this great lake Nyanza is nearly 4000 feet above the sea, it may well, indeed, be the main source of the White Nile. Everything (as far as theory goes) being in its favour, this view is farther supported when we reflect on the fact that the tropical rains cause these upland lakes and rivers to swell and burst their banks at a period which tallies very well with the rise of the Nile at Cairo. These, then, are grounds which I think must go to strengthen the belief of Captain Speke, and I may, therefore, repeat what I stated at the Anniversary, that highly worthy as Captain Burton was to receive a gold medal, not only on account of this great expedition which he led, but also for his former gallant and distinguished expeditions, Captain Speke, who now sits at your Lordship's left hand, is also entitled to a gold medal of the Royal Geographical Society.

MR. MACQUEEN, F.R.G.S., said he rose with great reluctance to express an opinion contrary to the views propounded by Captain Speke as to the sources of the Nile. He did so with more hesitation, because he had listened with the greatest pleasure to the Papers which had been read, and which he considered, in other respects, to be most interesting and valuable. He had really felt much edified by the documents read by both gentlemen, and he hoped they would not feel offended with him if he differed with them as to that lake being the source of the Nile. Mr. Macqueen then, interrogating Captain Speke, wished to know whether the vegetation on the south of the Nyanza was Tropical or not?

CAPTAIN SPEKE, in answer, asked Mr. Macqueen to specify what he meant by the difference of vegetation?—We are now engaged within the Tropics. There are palm-trees, acacias, and forest-trees—the forest ones are tall and slender, and are well branched on their upper extremities, like young oaks or elms. There are also large lays of tall grass, of a very rank order; but at the time I was travelling there it was the dry season, and consequently all herbage had dried up, and was otherwise, in most places, burnt.

MR. MACQUEEN had referred specifically to the Paper on that subject previously given to the Society. He concluded by requesting the President to oblige the Society by using his personal influence to obtain accurate accounts of the two Egyptian expeditions ordered by Mahomet Ali, the ruler of Egypt, in 1839-40 and 1840-41, to explore the White Nile, conducted by very able officers, in several sailing vessels, and which they on the first voyage effected as far as 3° 30′ N. lat. and 31° E. long. These exploratory voyages were certainly the most important of the kind that had ever been undertaken. The Egyptian Government would no doubt readily give them through the influence of our Foreign-Office and our Consul in Egypt. Care, however, must be taken that the whole are carefully and correctly copied from the originals, and not from mutilated and garbled documents that may have been made.

The **PRESIDENT** said he was well aware of the importance of having authentic information on the subject, and he would give his best attention to the point. He then called upon Colonel Sykes, who was the Chairman of the Court of Directors when this expedition was sent out, to make a few remarks.

COL. SYKES, V.P.R.G.S., said that he was scarcely prepared to respond to the noble President's call, as he had already commented upon the discoveries of Captains Burton and Speke at the last meeting of the Society, and had little to add. He might say, however, that the views enunciated by Capts. Burton and Speke are those which he had ventured to put forward some years ago, in a Paper on Zanzibar, published by the Society, as likely to result from an inquiry as to the sources of the Nile. It seemed quite natural that the Nile should issue from the Nyanza Lake, and that the lake itself should be supplied from the chain of mountains which runs parallel to the east coast, through several degrees of latitude; also that the lake itself might have its outlet to the north. We have analogous cases in our European system of rivers. For instance, the Rhone, which has its origin on one side of the Furca in Switzerland, runs down into the Lake of Geneva, and out of the Lake of Geneva to the Mediterranean Sea—a precisely similar instance. We have also the Rhine rising on the other side of the Furca, and running into Lake Constance, and thence into the North Sea. The Ticino flows from the Lago Maggiore down to the Po, and the Adda runs out of the Lake of Como; but the real sources of the two Italian rivers are not in either of the lakes, but in the water-parting of the Alps, which supplies the water with which the lakes are fed. The Nile and the Nyanza Lake may be in the same category. The elevation of the Nile at the highest point to which it was ascended by the French expedition, and the greater altitude of the lake, strengthen the supposition that the river flows from the lake. A difficulty, no doubt, presents itself in the fact that the Nile, in Lower Egypt, begins to rise in June, and continues rising until September, the water being supplied therefore by a summer monsoon coincident with that of Western India; whereas Captains Burton and Speke represent the monsoon they experienced to have commenced in the autumn—a monsoon that could not produce a rise of the Nile in June. However, it has to be determined whether or not the monsoon of the north of the Equator, in Eastern Africa, is or is not simultaneous with that of the Malabar coast; and the monsoon of the south of the Equator similar to the N.E. monsoon of the Coromandel coast, which begins in October. These questions now become of high interest, as touching the connexion between Captain Speke's lake and the Nile. We know that the Nile begins to rise in June, and that that rise must either be owing to a monsoon supply of water, or to the melting of snows. We know that in the case of the Blue Nile, in Abyssinia, the rising there is not occasioned by the melting of snows, but by the monsoon, which is coincident with that of Western India in the months of June and July. The question is, does that monsoon extend southward as far as Captain Speke's lake, and contribute to the rise of the White Nile as it does to the rise of the Blue Nile, in Abyssinia? The solution of this question alone is worthy of the labours of another expedition; but a great many other questions also suggest themselves. The work is only half accomplished, and the reputation of our country demands that it should be completed. My own opinion is, that independently of any commercial advantages or sordid considerations, the Society ought, for the simple investigation and verification of physical truths, to use its best endeavours to induce the Government to send out a second expedition. For the good name of England, let us have the doubt before us removed. We have an inkling of the truth; let us have the whole truth. Pliny was aware of the western source of the Nile, and said that it issued from lakes lying below the Mountains of the Moon. Now it is a singular fact, that the people in the neighbourhood of Captain Speke's lake call themselves Mnyamuezi—men of the moon; muezi also signifying the moon. And this association may have given rise to Pliny's account, that the Nile took its origin from the Mountains of the Moon. Colonel Sykes concluded with again urging the Society to address Government in the strongest manner to renew the geographical researches in Eastern Africa.

MR. GALTON, F.R.G.S.—Before making a few observations that occur to me on the subject of the papers before us, allow me to remark how closely analogous the gallant exploration of Captains Burton and Speke is to that which was undertaken thirty-seven years ago in the north of this same continent. It was in 1822, when Lake Chád, the populous Sudan, and the course of the Niger were only known to the European world through unsatisfactory and conflicting testimony of pilgrims and traders, that Captains Denham and Clapperton made their famous descent from the north, right through the Sahara, to the populous regions of Negroland, and the shores of Lake Chád, and by their momentous journey we reaped the first fruits of that considerable knowledge that is now possessed of those extensive regions. It is no small credit to our associates Captains Burton and Speke that they should henceforth take rank as the Denham and Clapperton of Eastern Africa.

However, in that part of the map before us which has been filled in from native testimony, there are some serious anomalies, which make me hesitate in accepting it on the evidence we now possess. In the first place, the Lake Tanganyika is represented as having no outlet, but as receiving more than one considerable river, and the drainage of a highly inclined basin, whose area can hardly be less than eight times its own. Not only this, but I am also assured by both Captains Burton and Speke, that its level is reported to be unchangeable, and that it appeared to them to be so. On the other hand, the rainy season experienced by our travellers on its shores was one of remarkable violence. The sky was perpetually overcast, drenching rains were constantly occurring, evaporation was *nil*, nothing could be kept dry, and a green mould settled upon almost every article. I cannot see any reason for estimating this rain-fall at less than the tropical average of 6 feet; and it is scarcely possible to imagine that less than four times the amount of what fell on the lake itself was added to its waters by drainage. We thus obtain a probable access to its contents of no less than 40 feet in altitude during the wet season, yet no alteration of level is found to exist. Again, a drought that would evaporate 40 feet of water during the six dry months of the year would assuredly reduce the land to aridity, but the country is thickly inhabited by peasant negroes, who are scattered widely over its face. I can see no way of explaining these matters from the information before us, except by concluding that our travellers were misinformed, and that the Lake Tanganyika *has* an outlet. I should remark that the drought of the desert of Ugogo is in no way incompatible with the fact of heavy rains visiting the lake district. It appears that the rain-bearing wind of these quarters is the east wind, and it is obvious that the moisture of its lower strata must be condensed against the eastern face of the plateau of Ugogo, which faces the sea like a wall, and consequently that the wind which passes over the plateau will be a dry wind. But as it passes on to the west, the upper undrained strata of the air will have time to mix with the lower ones, and to supply fresh material for the formation of rain-clouds.

Next, as regards the Lake Nyanza. I will pass over the strange fact that the boiling-water observations of Captain Speke give a constant *rise* from Unyanyembe to the surface of this lake amounting to no less than 300 feet, because that altitude is within the limits of possible error of observation; but I am particularly struck with the difficulty of accounting for the escape of the large quantity of water which is said to be poured from the lake into that river, which is commonly accepted as the true White Nile. We hear from M. Brun Rollet of its being crossed by means of a fallen trunk of a tree, at about 60 miles distance from the point to which he ascended, while the Lake Nyanza is described as receiving in that one small part of its circumference of which we have any information no less than 180 streams, of which two are considerable rivers. Mr. Findlay has suggested—and I quite concur in his view—that the waters of the lake may, in truth, be the head-waters of the Nile, but by means of some other channel than that of which I have just spoken, and for which there is an abundance of room, and also the existence of a native report, to the westward of M. Brun Rollet's river. Be this as it may, it is quite clear that Captains Burton and Speke have not only brought back a vast amount of solid fact, and given us a sound geographical basis upon which we can fit such native testimony as may reach us, but they have also opened out a most extensive field for future research—where future explorers, and I hope themselves, may proceed in various directions with the certainty of bringing back a rich harvest of geographical results.

Mr. H. Danby Seymour, F.R.G.S., was understood to ask whether there were any rivers on the eastern side of the Nyanza Lake to account for the passage of the water?

Captain Speke replied that he knew of none; but that at the northern extremity of the lake the Usoga people talk of one, the Kivira River, the right bank of which is occupied by the Bari people. These people were evidently the tribe among whom Mr. F. Werne arrived only a few years since. When communicating with their King Lakono, Werne was assured that the branch of the Nile which he was exploring came from a distance of 300 miles due south of Bari: a point directing him to the exact position in which he, Capt. Speke, had discovered the Nyanza; at any rate the rising of the Nile is very considerable at the Mission Station, Gondokoro, in lat. 4° 40′ N., and is very broad. These waters must come from some considerable source. He considered the Nyanza to be the true source of the Nile, and the point at which he reached it to be the most extreme from the debouchure of the Nile at Alexandria. Even supposing that there does not exist any overflow of the lake at the northern end, which might probably be the case in the dry season, he believed that it will bear the same relation with the Nile at Gondokoro that the Parung La Tso (River) does with the Sutlej. There is no overflow from the surface of the Tso Moriri (Lake), yet it is the principal source of that branch of the Sutlej River which the Tibetans call the tributary Parung La Tso, after the Parung La (Pass), which also receives the Tso Moriri waters by percolation. The Tso Moriri waters filter through spongy bogs for a short distance, and then collecting, taper off in small channels to the Parung La Tso.

The PRESIDENT then invited Captain Burton to give some information respecting the native manufactures and productions.

CAPTAIN BURTON, F.R.G.S.—The finest copal in the world is exported from the Coast. These regions also supply the largest, whitest, and softest ivory. The other exports are chiefly rhinoceros horns and hippopotamus teeth. Cotton is found in every part of the country where the water is near the soil and where the country is marshy; it grows in great abundance round the Lake Tanganyika. Here is a specimen of cloth made in Unyamwezi, the "Land of the Moon" [the cloth was produced.] The natives, however, prefer the American fabrics on account of their being closer and lighter. Iron is found throughout the country in great abundance. Coal may exist [the Captain exhibited specimens of native iron]. Copper is only to be found in the country of the Kazembe, so frequently visited by the Portuguese traders. Coffee is not cultivated, and therefore is not of use in commerce. There is a particular kind of frankincense found in all the countries about the dry table-lands beyond the mountains. The palm-oil tree grows almost wild; I have brought home a specimen used by the inhabitants. The great want of the country is the facility for carriage. A tramroad from the coast to the Lake would materially increase the commerce, and it could be laid down at comparatively very little expense. Hides are procurable in any quantity, and there are many other sources of wealth which are comparatively useless on account of the difficulty of transport. Rice and grain might be grown in great quantities. Horses will not live eight months in the country. Asses are found to be of very little service; they are not strong, and people will load them too much. Independently of their load, we found that one died simply from the fatigue of walking down to the coast. Oxen do not thrive in some parts of the country, owing, it is supposed, to a poisonous grass. In some parts, especially in Karagwah, Ujiji, and the whole of that district, there is a large dun-coloured animal; the numerous wars, however, tend greatly to diminish the cattle. Almost all the wars are on account of cattle or of slaves. Generally speaking, a tribe does not sell its own children, except for powerful reasons. The usual course is to obtain supplies for the trader by attacking and plundering their neighbours. There are two kinds of slave-trade: the external domestic slave-trade, carried on by Arabs with great difficulty (this will be in the course of time put down), and also the internal slave-trade, which demands still more strongly the attention of Europe, for nothing but the development of the commercial resources of the land can affect it.

The PRESIDENT.—As the usual time for adjournment has arrived, there is only one other duty which remains for us to perform this evening, namely, to vote our cordial thanks to the gentlemen who have submitted their papers to us. After the very full discussion which has taken place, I will not detain you with any farther observations of my own. I would merely say that, while we must admit the very great importance of the information we have received from these papers, we cannot but contrast the knowledge which we now possess with that which we enjoyed before this expedition went forth.

Fourteenth Meeting, June 27th, 1859.

THE EARL OF RIPON, PRESIDENT, in the Chair.

PRESENTATIONS.—*S. W. Silver and Christian Hellmann, Esqrs., were presented upon their election.*

ELECTIONS.—*The Earl of Airlie; Major Henry Cracroft; the Earl of Elgin; Captain Philip D. Margesson,* R.A.; *the Hon. Robert Marsham; the Duke of Newcastle; Sir Hercules G. R. Robinson (Governor of Hong Kong); and George Barclay; Frederick W. Bigge; H. Austin Bruce,* M.P.; *R. A. Osborn Dalyell (Consul at Erzerúm); George H. Fitzroy; William Fryer; Charles P. Grenfell,* M.P.; *W. Vernon Harcourt; and William H. Smith, Esqrs.; were elected Fellows.*

EXHIBITIONS.—Several drawings and photo-lithographs illustrating the scenery and physical geography of the highest parts of the Himálayas, by the Messrs. Schlagintweit; and a Mechanical and Magnetic Compass, invented by Mr. N. D. Maillard, were exhibited.

ACCESSIONS.—Sir John Rennie's work on the 'Plymouth Breakwater,' presented by the author; Humboldt's 'Travels,' 'Cosmos,' and 'Aspects of Nature, *etc.*,' presented by H. G. Bohn, Esq., F.R.G.S.; Dr. Lange's Map of the Mediterranean, and Stanford's Library Map of Australasia, were among the late accessions to the Library and Map Rooms.

The Papers read were—

1. *Notes on a Voyage to New Guinea.* By ALFRED R. WALLACE, Esq., F.R.G.S.

THERE is only one place in New Guinea where the natives have become accustomed to the presence of European and Mohammedan traders. This place is Dorey, and it was there that Mr. Wallace has been residing for three months. He describes the whole northern peninsula of New Guinea as exceedingly rugged and mountainous. A continued succession of jagged and angular ranges stretches away far into the interior; while an unvarying forest of somewhat stunted appearance spreads over the whole country. He considers there are absolutely no other inhabitants than Papuans in the main island. During Mr. Wallace's stay at Dorey there was almost continual rain or drizzle. When these were absent there was often a dull haziness in the air, very different from our usual notions of the sunshine of the tropics. The last month of his stay was nominally in the dry season, but the rain-fall was in reality increased. The winds also were abnormal. According to theory, he would have gone to the island in the west monsoon and returned in the east; but, each way, the winds were contrary, and interspersed with dead calms. Dorey is not a good station for starting on excursions into the interior. It is also very unhealthy: Mr. Wallace and his servants suffered constantly from fever and dysentery, and one of them died. The Dutch Government has taken possession of New Guinea up to 141° E. long. from Greenwich. An active and exclusive trade is carried on between that coast and the Moluccas, under their flag. The beautiful series of maps of the Dutch possessions in the East, by Baron Melville von Carnbee, are particularly remarked by Mr. Wallace. A Dutch steamer was surveying the coast of New Guinea while Mr. Wallace was there, in search of a good place for a settlement. He understood that Dorey would, probably, be preferred on account of its harbour and naval position, though in other respects unsuitable.

MR. J. CRAWFURD, F.R.G.S.—I have never visited the island of New Guinea, but I have paid much attention to the subject, and ought to know something about it. It is a monster island, and, although beyond doubt God created nothing in vain, it appears to our narrow view that New Guinea was created for no earthly good purpose. It is nearly twice the size of the United Kingdom, is universally covered with forest, and inhabited throughout by a peculiar negro race—a race which commences at that island and extends all the way to New Caledonia and thence up to the Fiji Group, where it ceases. This race strongly resembles the African negro, but still it is not the African negro: it differs very materially from it. It has the general African features, but the hair, especially in its texture, differs in a very singular manner. Instead of being woolly, like the head of the ordinary African, it grows in tufts so long that it stretches out to an enormous extent—two or three feet right across—a circumstance which has obtained for the Papuans the name of "mop-headed Indians." Everywhere this race is intellectually inferior to the brown-complexioned people, as I am afraid it must be said of the negroes of Africa, that they are inferior to all the fairer people in their neighbourhood, even those on the continent of Africa itself. A remarkable example of this inferiority is given in Dorey Harbour and a considerable part of the coast in its neighbourhood. The people are subject to the government of a very small island, a mere rock in the sea—the island of Ternate, containing a comparatively active and industrious population of the Malay race, who, in consequence, have been put in early possession of some wealth and power, and been enabled to conquer and hold in subjection a considerable portion of the population of New Guinea. The inhabitants of New Guinea are in a very low social condition, inferior, indeed, to that of any other people that I know of, except perhaps the inhabitants of the Andaman Islands. New Guinea produces some very remarkable objects. It produces the true aromatic nutmeg, some very singular birds, and, among these, the Birds of Paradise, which are peculiar to that country, and which seem to be good for nothing except to produce fine feathers to adorn European ladies and Chinese mandarins. There are ten or twelve different species of this beautiful bird, which, after all, is but a kind of crow. The island also produces a monster pigeon, almost as big as a turkey—a most beautiful bird, of which there are, I believe, two species. Living specimens of these are to be seen in the Zoological Gardens. Dampier gave an exceedingly good description of New Guinea about 170 years ago.

Dr. G. Kinkel, f.r.g.s.—I should not address this meeting if there were any gentlemen present who had visited New Guinea, but since it is a country which we know almost exclusively from books, I may be allowed to say a few words on some new points in the report before the meeting. The first point is—and I think it is an entirely new one—that there is only one race of people in this island. We have been accustomed to believe that there were two different races: a Malay race in the interior, and a black race skirting the coasts. This relation of the two races would indeed make the island an exception to all maritime countries in that quarter of the world. It appears, however, from the paper of Mr. Wallace, that there is in the interior an agricultural race, whose dwelling-places would seem to be somewhat different in construction from the huts of the outlying tribes along the coast, who bear the especial name of Arfaki; and although Mr. Wallace does not enter fully into the subject, it yet appears that this theory of two races—one black, a trading class, and another more agricultural, in the interior—is not entirely exploded by his observations. The second point seems to me to be of some importance: it is that this island is not favoured with the clear tropical sunshine which we might expect. The very height of the mountains of New Guinea, which in some parts near the coast attain an altitude of 9500 feet, must, in a warm climate, and in the midst of a really steaming ocean, of necessity cause heavy rains; still more the amount of vegetation in this large and wonderful island, although stunted in its growth, must of necessity produce a vast amount of precipitation. The great point, however, to which I would call attention is the irregularity of the monsoons mentioned by Mr. Wallace, which, I think, is very important to navigators. This irregularity is not difficult to explain. New Guinea lies at the outskirts of the Indian monsoons; the monsoons are produced, as every wind upon the globe is, by the heating of certain parts of the great continents. The enormous heating in the central parts of Asia during our summer causes a stream of air from cooler and more southern latitudes to flow over them, producing the south-west monsoon; and the north-east monsoon is attracted in the same way by the great heating of Southern Africa in the contrary season; consequently, these eastern islands, like New Guinea, can only be considered as lying on the outskirts of the monsoons, and the absence of great continents around them will account for the greater irregularity of their periodical winds. The influence of the monsoons by this different heating of great continents is no longer powerful enough to keep off a current of cooler air from the ocean in these parts. This, I believe, will explain Mr. Wallace's observation, which, as I said, is of very great importance to navigation. As to the discovery of New Guinea, the Dutch certainly are the principal investigators of this island. They were the first to discover the existence of a narrow channel between the small island to the south-west, called "Prince Frederick Island," and the main land. They were also the first discoverers of the great bay, and, finding a quantity of yellowfinches there, they called it "Geelvink," or "Yellow Finches' Bay:" a name that has been given to it since in all our charts. The Dutch claim half the island up to the meridian of 141°, and it is under their flag and from their dominions in Dutch India that the principal trade is carried on in these islands. And as we owe to them almost all we know about this island, it seems but fair that they should obtain the credit and also the profit (if there be a profit, which I much doubt) of its possession.

Mr. Crawfurd.—I should like to say a few words in reply to the gentleman who has just spoken. Perhaps he is not aware that there are two distinct classes of monsoons. The south-east monsoon and the north-west monsoon, which blow to the south of the equator, are totally different from the monsoons with which we are better acquainted, namely, the north-east or monsoon of the winter solstice, and the south-west or monsoon of the summer solstice. The first are the monsoons that prevail in New Guinea, and I believe that they are perfectly regular: there is no irregularity at all that I have heard of, any more than in those which prevail north of the equator. With respect to an agricultural people inhabiting New Guinea, I have never heard of them or of any kind of agriculture beyond the poor one described by Mr. Wallace. I believe no agricultural people to exist in the island, and that its inhabitants throughout are rank barbarians and savages. Dr. Kinkel must not suppose that New Guinea is the only island inhabited by negroes: there are several others exclusively inhabited by this race. New Caledonia, for example, is entirely inhabited by a robust race of negroes; New Ireland is inhabited solely by them. With respect to the discoveries of the Dutch, I ought to mention that they have in recent times made very considerable ones. The original discoverers of New Guinea, however, were not the Dutch: the island was discovered nearly 100 years before the Dutch had even made their appearance in India. The original discoverers were the Portuguese, and a very considerable portion of the island was after them discovered by our own truly illustrious countryman Dampier. The more modern discoverers are certainly the Dutch; they made three distinct voyages to that country. They discovered Prince Frederick Island, which had previously been supposed to be a headland. Their first voyage was made, I think, in 1828, and their last in 1835, when they attempted to form a settlement; but they found the country so unhealthy, so rude, and so sterile, that they were obliged to give up the settlement. With respect to their claim to half the island, the Dutch are perfectly welcome to every inch of it. No Englishman would dispute it with them or think of forming a settlement in a land so unpromising: I wish the Dutch well, and therefore I wish them safe away from New Guinea.

Mr. T. Saunders.—The discussion having been directed to New Guinea at large, I think allusion should be made to the recent discovery on this island of the great river Rochussen or Ambernoh entering the sea by an immense deltoid mouth on the north-east of Geelvink Bay, nor in speaking of recent discoveries ought we to forget the share the English have had in them towards the south-east, where mountains, rising in some cases more than 13,000 feet above the sea, have been measured in altitude by our own nautical surveyors.

It may be added that the north coast of New Guinea was not long since examined by Sir Edward Belcher, in H.M.S. *Samarang*, and the present Curator of the Society, Mr. George, was in charge of the observatory. The proximity of New Guinea to Northern Australia, and the extension of the Australian settlements in that direction, may also be alluded to as a probable means of increasing our knowledge of the unknown interior of New Guinea.

The President.—In proposing a vote of thanks to Mr. Wallace for his very interesting Paper, I would only say that I think the glimpse which we have had of the geography and natural features of New Guinea must leave an impression upon our minds that it is very desirable to have more information in reference to that island; and I venture to express a hope that Mr. Wallace will renew his explorations in that country, and may be able to favour us at some future period with further information respecting it.

The second Paper read was—

2. *Remarks on Portuguese Journeys in Central Africa.* By JAMES MACQUEEN, Esq., F.R.G.S.

SILVA PORTO is a Portuguese trader, who has written an account of three journeys that he undertook in Southern and Central Africa, starting from Benguela. In the first he reached Castange, in his second he travelled still farther, and in his third he crossed the entire continent on a parallel to the north of Livingstone's route.

He emerged at Mozambique, having journeyed in the company of some Zanzibar Arab traders, who had themselves previously crossed the continent, and were then returning homeward. He was on the road from June, 1853, to November, 1854, of which time he employed 190 days in actual travel.

Silva Porto's itinerary is little more than a statement of days' marches and of their directions, recorded very roughly, together with a mention of the rivers he crossed and an estimate of their breadth. From these materials, and from an occasional similarity of names, Mr. Macqueen endeavours to bring Silva Porto's geographical facts into comparison with those of Livingstone and other travellers, and has exhibited the result in a diagram which accompanies the present paper. Without the aid of this diagram it is wholly impossible to do justice to Mr. Macqueen's minute analysis. It will be published in the Journal of next year, together with his paper in full.

With the exception of three culminating points, Silva Porto's route usually lay through fertile plains, subject to heavy rains, and cut up with rivers in many places.

At the close of his paper Mr. Macqueen makes the following remarks on the commercial value of South Central Africa:—

> "In taking a general survey of Africa, it is at once evident and undeniable that the Portuguese possessions or dominions in South Africa are the most valuable and most important and useful portion of that vast and hitherto neglected continent. Expanding along the East Coast 1000 geographical miles, and along the West Coast 700, they command the entrance into every part of the interior, well known to be comparatively wealthy and all fertile, capable of producing every article of agricultural produce that is known in the tropical world. Their claim also to most of the interior is preferable and well known. More than one river, especially the Zambesi, opens up to some distance a communication with more remote countries in the interior. It is also in many places very populous, but these people are generally engaged in internal wars. The greatest misfortune that ever befel Portugal was the withdrawal of her attention from Africa to the Brazils, and the removing of such multitudes of her population from the former to the latter. In Africa itself her population can be best and most profitably employed, and that employment only can regenerate Africa and raise her to wealth, independence, and civilization, so as to become useful to herself and to the rest of the world,

The ablest Portuguese statesmen now clearly understand this truth, and their exertions will shortly produce in Southern Africa as great a revolution in the commerce of the world as the discovery of the Cape of Good Hope did soon after it was made."

The PRESIDENT.—I see a great African explorer here, Captain Burton, and ask him if he has any observations to make upon this part of Central Africa?

CAPTAIN BURTON, F.R.G.S.—My experience of Central Africa is more in the eastern than in the western country. Perhaps some little account of the Arabs, to whom Mr. Macqueen has just alluded, may be permitted, especially as Dr. Livingstone met them in the very centre of the African continent. They left Zanzibar about 1842, and travelled over the Unyamwezi country. They crossed the Tanganyika Lake, viâ Ujiji, and from that point they went to the south-western country of Marungu: there they fell into trouble in consequence of a blood feud with the people. Their boats were burned, and they found themselves unable to return to Ujiji. They were almost the first traders that crossed the Tanganyika Lake. They were compelled to go on from Marungu again to the south, and, as well as I remember, Dr. Livingstone met one or more of them at Linyanti.

MR. MACQUEEN stated this was not the party of Arabs to which he had alluded.

CAPTAIN BURTON.—I understood Mr. Macqueen to allude to the party of Arabs who crossed over from Zanzibar. I left Zanzibar in February last, and no other party had gone from Zanzibar to the western coast.

MR. MACQUEEN said it was another party.

CAPTAIN BURTON.—Mr. Macqueen seems to allude to some other party, but I have never heard of any except those Arabs who left in 1842. Another point which strikes me in Mr. Macqueen's account is the immense length of the marches—11½ geographical miles in Central Africa. I believe that hitherto such marching in the country in which I have been is quite unknown: 10 statute miles, or about 6 geographical rectilinear miles, would be a high average.

The PRESIDENT.—I am sure we are much indebted to Mr. Macqueen for his Paper, and particularly for that interesting and remarkable sketch with which it concluded of some of the general geographical features of the region of Central Africa, and especially of the character of its rivers. The whole subject is one which has occupied the attention of this Society and of the public so very much of late years, since the explorations of Dr. Livingstone and of Captains Burton and Speke, that we are always glad to receive any addition to our stock of knowledge. The history of the journey of these Portuguese Arabs from one coast of Africa to the other is full of interest, and I have no doubt that, when the Paper is printed in full, we shall find that many points of importance have unavoidably been omitted this evening. Mr. Macqueen will fully understand that it is impossible to read the entire Paper this evening.

The third Paper read was—

3. *Notes on the Island of St. Helena; to accompany his new Map of that Island.* By MAJOR EDMUND PALMER, R.A., F.R.G.S.

CAPTAIN PALMER's map of St. Helena was executed during a residence of nearly six years on that island. It is shortly to be published, on the reduced scale of [illegible], by the Topographical Department of the War Office. The present paper is a concise memoir of the history and of the present condition of the island,—its geology, fauna, and statistics,—and may be considered as an accompaniment to the map.

He remarks,—"St. Helena lies in the strength of the S.E. trade wind, and is usually sighted by ships at a distance of 20 leagues, rising like a huge fortress from the bosom of the ocean. It is surrounded by a wall of precipitous cliffs from 1000 to 1800 feet in height, intersected by chasms, serving as an outlet for the watercourses of the island, and terminating in small coves more or less exposed to the fury of the waves. There are no less than twenty-three of these openings around the coast; but landing is almost impracticable except on the north-western or leeward side, and at Prosperous and Sandy Bays to windward, and even then only in favourable weather. The most singular phenomenon connected with this part of the ocean is the setting in of very heavy continuous swells, called 'Rollers,' from the N.N.W., particularly during the month of February, when the waves burst on the leeward shore with astonishing grandeur and impetuosity. During their continuance landing is extremely dangerous, and can only be effected by watching the intervals between the swells. In February 1846, thirteen vessels moored at half a mile from the shore were totally wrecked, and the wharves and batteries suffered considerable damage. No satisfactory solution appears to be given for this phenomenon; and the suggestion by Colonel Smythe, R.A., F.R.G.S., that simultaneous observations should be carried on during the period of 'Rollers' at Ascension, Tristan d'Acunha, and St. Helena, appears to offer the most practical method of arriving at anything like an explanation of the cause."

The rain-fall of the island is about 27 inches. Its temperature varies according to the altitude and exposure of the locality. At High Knoll, 1900 feet above the sea, it is from 65° to 70° Fahr.; at Ladder Hill, 600 feet, 70° to 80°; and in James Town, 75° to 85°.

Statistics, 1857.—Acreage, 30,030; of which, uncultivated, 22,160; pasture, 7652; Crops, 482.

Live Stock.—Cattle, 1625; sheep, 4230; horses, 230; goats, 670.

Inhabitants.—Males, 2973; females, 2517. Total, 5490.

Finance.—Revenues, 19,837*l.*; expenditure, 19,079*l.*

The PRESIDENT.—If no gentleman wishes to say anything concerning this paper, I would state, in moving a vote of thanks to Major Palmer, what the circumstances were under which his map was made. Major Palmer was quartered in St. Helena, and he made that survey himself as a labour of love, not by any orders of his military superiors. Under these circumstances, I am sure you will most readily vote your thanks to him, not merely for the interesting details which he has given us of the history of the island, but also for the valuable information he has been the means of providing for this Society and the world at large.

The fourth Paper read was—

4. *Travels in Siam and Cambodia.* By D. O. King, Esq.

Mr. King's Paper is accompanied by a map, and contains the result of a year's travel through the hitherto imperfectly known lands of Eastern Siam and the modern remnant of the old kingdom of Cambodia. He travelled from Bankok to the Bang-ta-kong river by a canal. This is a line of route in extensive use by travellers, who would otherwise have to skirt the rocky and mountainous coast. It passes through a flat alluvial country, entirely covered with rice fields, and swarming with musquitoes. The Bang-ta-kong river was then ascended: it is about 40 yards broad and winding, and there is a broken strip of cultivation on either bank, while large tracts of good land are allowed to remain waste. The Siamese have introduced some coolie labour, though they are averse to its general adoption.

A military road was constructed, twenty years ago, from this river to the Tasawai. Its bridges are now broken down, and the road is a mere wreck; nevertheless it is the only existing route across the country, and Mr. King travelled by it. All travellers in Eastern Siam use elephants: these beasts are in general employment as far as Cochin China, and are remarkably cheap. A full grown one costs only from 50 to 70 dollars. But elephant riding in Siam is very tedious. The roads are almost impassable by floods in the wet season, and are parched with drought during the dry; while the animals become sick and footsore if pushed beyond twenty miles a day.

No trace was found of the ancient capital of Cambodia, excepting only its temple, with its immense quadrangle. It stands surrounded by jungle, and is still considered a shrine: a few Buddhist priests live there. Mr. King extended his travels to within the frontiers of Cochin China, having visited a Roman Catholic mission establishment on the Oodoong river.

He considers there is little new or strange in the fauna or in the mineral produce of Eastern Siam. Wild animals are far from numerous. The pest of insects and other creatures seems almost unendurable; the worst of them all being the ground leeches, which fasten greedily on men and animals, and make sleeping in the open air an impossibility.

The President.—This, gentlemen, as you are aware, is the last meeting of the present session. Before we part, I would make one observation. This beautiful room in which we are now assembled has been lent to us by the kindness of the University of London and the Royal Society. I am sure you will readily agree with me that we are much indebted to these Bodies for having allowed us to meet here. The Council of this Society have this day agreed to request these two distinguished Institutions to permit us to continue the use of this room—that is, if the building itself should be permitted to remain in existence. We hear rumours that it will not—rumours which, upon public grounds, as well as in regard to the interests of this Society, I trust may not be true. While we feel grateful to the Royal Society and to the University of London, I am sure I shall be only expressing the feelings of the Society at large, if I indulge in the hope that this may not be the last occasion upon which the Royal Geographical Society may assemble here.

SIR RODERICK MURCHISON.—Before the meeting adjourns, allow me to call its attention for one moment to some beautiful photographic sketches that are now laid upon the table. On the occasion of the last Anniversary it was my duty to notice the merits of those distinguished explorers of the distant parts of Asia, the brothers Schlagintweit, one of whom, Adolphe, has unfortunately fallen a victim to his zeal. The other brothers, Hermann and Robert, after their various exploits, have now placed before us a number of illustrations which they have prepared. These are chromo-lithograph sketches of those very elevated mountains of the Himálayan range which these gentlemen explored, and which now for the first time are made known to geographers. As I find that one of my friends, Mr. Hermann Schlagintweit, is present, I take the liberty of requesting that he be permitted to offer one or two observations to the meeting in explanation of these sketches.

MR. H. SCHLAGINTWEIT.—One of these drawings on the table represents Kunchinjinga, one of the highest mountains in the Himálayan range, whose altitude is 28,150 feet, and which is also interesting from the great analogy of its geological formation to the higher summits of the Alps. It is not true granite, but mica schist and gneiss: the true granite is met with in the Himálayas, but it forms a narrow zone at the southern foot of the Bhutan Himálayas. Another plate represents, in similar execution, Gaurisankar, or Mount Everest, till now the highest known mountain on the globe, found by Colonel Waugh to exceed 29,000 feet. I may mention in a few words the interesting signification of its native name, the meaning of which very nearly coincides with the meaning of that which is given in the Bhutan to the highest of its Himálayan summits, videlicet to Chamalari. In the name Gaurisankar, Gauri is the name of a female deity, Siva's wife. In Chamalari Chama has the same signification. Sankar, as well as Lha, is the respective name of Siva. In the Bhutia name the word "*ri*," meaning mountain, is added, which is dropped in the Nepalese name. A third plate represents one of the largest groups of glaciers we have met with on our journey. It is a glacier of the first order—considerably longer than any of the glaciers of the Alps, and interesting also as showing, like all the great glaciers in the Himálayan and Tibetan ranges, a much greater decrease than the glaciers do, generally speaking, in the Alps. In the Alps we had occasion to measure a great number of glaciers with reference to their distance from the extreme moraines, and we found, as specified in our "Untersuchungen," to our surprise, that by far the greater part show a small decrease—that is to say, the greater part of the Alpine glaciers was found considerably distant from those moraines which could be considered as the marks of their greatest extent in the recent periods of oscillations. But in the Himálayas, there is not one glacier reaching its extreme moraine; *all* of them are decreasing. The cause of this general decrease is a very curious one. The average depth to which the rivers have cut in the Alps does not exceed, generally speaking, and rarely ever reaches 200 feet. In the Himálayas it frequently occurs that this erosion reaches a depth of 1200 feet, and the consequence is a very important one as regards the physical geography of the country. The physical result, in reference to a glacier, is that not only a place is generated which is 1200 feet deep, and which in consequence is much warmer than the spot which existed at the same locality before; but also that, on account of the formation of the erosion, a current of heated air is going up as through a funnel, which acts most effectually in reducing the size of the glacier, and which gradually increases as the erosion extends. Another curious fact, which, we think, finds its explanation by the erosion, is the absence of waterfalls in the mountain systems of High Asia, and more especially in the Himálayas, where this want of waterfalls often has been mentioned without any attempt at explanation. The opinion about this remarkable want of waterfalls which we allow ourselves to present is this: The lateral rivers, during the rainy season, have such an increase of water that they act nearly as powerfully as the large rivers do, since at the same time they have a much steeper descent. The consequence is that generally the large and small rivers unite at about the same angle of inclination. Consequently waterfalls which formerly existed, and of which traces are yet seen, have been entirely eliminated from the Himálayas.

Another consequence of the erosion is the gradual drainage of fresh water lakes, or their conversion into salt water lakes. It is very characteristic for the Himálayas, and in this respect they differ essentially from most other mountain systems in the world, that hardly any fresh-water lakes now occur. The only few lakes of any considerable extent which have been made known by Captain Strachey, Captain Speke, and Major Cunningham, as well as those we visited besides, are all salt water. But the explanation we think we must give of this phenomenon is different from the explanation formerly given. Some have thought that a raising of the country might have caused a general drainage. We think that supposition rather improbable, from the recent strata round these salt lakes being all horizontal, and the outlets of these salt lakes being in a different direction in reference to the horizon. If any raising of the country had effected the drainage of the salt lakes, the effect would have been a perfectly different one, according to the position the outlet of these lakes had in reference to the points of the horizon, a modification which is nowhere met with.

The Tso mo Ri ri and the Tso mo Gnalari, the two great salt lakes of Rupchu and Pankong, of which drawings are presented, happen to be a good example of two large lakes, being about equally salt, with differently directed former outlets, and with quite horizontal banks of detritus and of watermarks along their circumferences. The gradual progress of the erosion of the valleys seems to us to be also the chief cause of the gradual transformation of freshwater lakes into saltwater lakes in Tibet.

By this progressive excavation thousands of square miles, still marked as former lakes by the form of the surface, have been emptied, and the consequence is that the local evaporation could no more keep the equilibrium with the precipitation; in consequence the lakes, of which parts remained undrained on account of their greater depth, now gradually became more and more salt. I could add still many observations about the various characteristic features of the physical geography of the tropical and high land and glacial regions, which we have tried to represent in our drawings, amounting, as the catalogue presented shows, to 700; but I conclude with repeating my apologies for having already passed the hour allowed to discussion.

Sir Roderick Murchison.—A very great subject which has been brought before you by my friend Mr. Hermann Schlagintweit—one which would lead us into the consideration of the physical geography of the Himálayan and Karakorum chains, and even beyond the latter across the Kuen Lun—subjects too vast to be entered upon at this hour of the night. The observations which my friend has just addressed to you respecting the lakes, drainage, and the ancient configuration of this country, are obviously matters of such magnitude, that if we had begun the evening with them we might have descanted upon them for a good hour with great satisfaction. Let me, however, state that the brothers Schlagintweit were selected to perform these services in the East by my illustrious friend the late Baron Humboldt. And why? These gentlemen had ascended peaks of the Alps which no other persons had climbed, and had made themselves acquainted with phenomena with reference to the mountain system of that country which were before that unknown to geographers. It was, therefore, felt that they were especially capable of undertaking the examination of the range. I think we have reason to thank them for bringing before us such natural features as are indicated in the beautiful drawings on our table, and I am sure that the Geographical Society does well in recognizing the merits of these distinguished German explorers.

The President.—It is too late to enter into any discussion. We are much indebted to Sir Roderick Murchison for bringing these drawings under your notice, and our thanks are eminently due to the Messrs. Schlagintweit.

ADDITIONAL NOTICES.

1. *Geognostic Sketch of the Western portion of Timor.* By Dr. Salomon Müller.

Communicated by John Yeats, Esq., ll.d., f.r.g.s., &c.

The exterior of the western portion of Timor is very mountainous. Countless streams of various size springing from a central elevated ridge, traverse the island in a northerly or southerly direction. Their beds are mostly strewn with boulders and sandy gravel from different species of rocks.

The principal mountains of Timor's western half are of the older Neptunian formation, systematically designated the greywacke group.

a. The greywacke limestone, forming in Timor huge piles of rock and steep mountains, some of them rising 4000 to 5000 feet above the sea-level, consists of a thick mass, with flat shelly fracture, commonly of a grey, but sometimes of a red colour, and intersected in all directions with veins of white calcareous spar, often in quantities so large that the original mass almost disappears, and the rock assumes a crystalline aspect. Large or small hollows or fissures, covered with pointed rhomboidal crystals of calcareous spar, are not unfrequently found in it.

The hills and higher elevations composed of this limestone may be easily distinguished, even at a considerable distance, by their characteristic forms, from the rest of the island. Their outlines are mostly very angular, often serrated, and not unfrequently exhibit needle-like and turreted tops, that rise to an imposing altitude.

b. The greywacke sandstone connecting itself immediately with the preceding species of rock, forms mountains less strongly marked by rude and sharp outlines; yet some of them with conical tops belong to the highest peaks (6000 to 7000 feet) of the island. To them, besides, rounder and more softly swelling lines are peculiar, not unfrequently consisting of long backs; while their declivities are commonly covered with grass, bushes, or trees, through which the naked cliff glistens at intervals. The rock itself is of a grey or yellow-brown colour. The granular specks imbedded in a scarcely distinguishable paste, are irregular in size, varying from a line to infinitesimal minuteness.

c. The clayslate exhibits a homogeneous mass of very scaly properties. The colour varies from a light grey to a dark black. As the carboniferous particles increase, the rock possesses less cohesion and solidity, which peculiarity in the black variety increases to such an extent, that it is transformed into a true drawing-slate, the so-termed black chalk.

The greywacke group is at Timor the principal formation, and it really contributes to the peculiar character of the country. Including the highest mountains, it extends from close to the bay of Koepang, in a north-easterly direction, through the middle of the island to almost equal distances from both sides of the sea-coast, and thus forms as it were the core of the country to which the other formations attach themselves. The richest gold-bearing rivers, as well as those in the beds of which pieces of pure copper and copper ores are found, have their sources within its limits, and flow through it for a considerable distance.

At the southern foot of the mountain Micomaffo, near to the place where the clay-slate forms a vast deposit, the sandstone of the above-named group is broken through by serpentine.

Along with the serpentine, and closely related to it, appears a conglomerate containing angular pieces of common serpentine and ophites, mixed with more or less altered remnants of greywacke sandstone, which pieces of stone are united into one solid mass by means of a pitchstone-like paste.

To judge from what we have seen and heard respecting gold and copper at Koepang, we think it must be maintained that the eastern parts of the island under Portuguese sovereignty are much more richly endowed than the western districts belonging to the territory of the Netherlands. Almost all the copper, as well as most of the golddust, obtainable at Koepang, and brought chiefly by Chinese merchants, is derived from the Belonese countries. Mines, however, properly speaking, are nowhere to be found; those metals are mostly obtained by washing from the beds of rivers, and from other places, out of a sandy or clayish soil. The value of the Timor gold is commonly 20 to 21¼ carats in fineness. Copper often appears in a pure state. Amongst others we have received at Koepang, from the Portuguese territory, a pure piece of the weight of 2·68 kilogrammes, and of a fig-like form. Other similar pieces of pure copper were seen by us there of different sizes. Professor Reinwaardt makes mention further, in a report concerning the appearance and the quality of the metal in the island of Timor in the year 1827, furnished by him to the Minister of Marine and the Colonies, of a very rich copper ore containing nearly 85 per cent. of pure metal, which may easily be obtained from it by proper smelting. With this ore derived from the Dutch territory, are mixed, moreover, says this savant, single pieces of pure copper.

Our reports differ in more than one respect very considerably from those of our predecessors, among whom Peron, for instance, maintains that Timor is indebted for its existence to the slow but ceaseless labours of the coral insect; while Quoy, Guachichaud, Freycinet, and other later travellers, ascribe it chiefly to volcanic action. There are no volcanic mountains, nor were even the slightest traces of true volcanic rocks found by us.

Pulo Kambing, in the strait Samauw, is composed of the greywacke sandstone, and contains mud volcanoes.

Pulo Samauw has mineral springs.

2. *Journey in Asia Minor.* By M. P. DE TCHIHATCHEF, HON. F.R.G.S.

Communicated by SIR R. I. MURCHISON, V.P.R.G.S., &c. &c. &c.

Samsun, Sept. 15, 1858.

MY DEAR SIR RODERICK,—I am at last returned to Samsun, whence I started four months ago in order to explore those tracts of Pontus and Armenia which had not been visited before by any naturalist. My peculiar object was to fill up those empty white patches which are very numerous and more or less extensive on the best maps. The first, which I met with almost at the doors of Samsun, was the tract between the river Iris (*hodie* Yezil Irmak) and the line which marks the great road from Tokat to Amasia, and from the last city to Samsun. After having explored this tract, which I found full of lofty mountains, the passage of which was rather difficult at the end of May, I went to Niksar, and followed the Germeli-tchai (Lycus of Strabo, a large affluent of the Iris) to Chabhana-Karahissar, where I had an opportunity of examining very interesting alum mines, which, were they worked in a less barbarous way, and particularly on a larger scale, might provide Europe with most valuable alum, for almost all the trachytic mountains of the country (there is no trace of *cretaceous* deposits, as marked on your geological map of Europe, and that of Dumont) are full of this useful mineral, which forms nests or patches in the trachyte very easily to be worked without any complicated subterraneous labour.

As all the extensive country between Chabhana-Karahissar and the shore of the Black Sea is left blank on the map of Mr. Kiepert, and was, in fact, until my present exploration, a true terra-incognita where the geographers place arbitrarily the chain of the *Paryadres*, mentioned by Strabo as being situated somewhere between Trapezunt and Amisus (Samsun): in consequence, I determined to march northward from Chabhana-Karahissar, and to advance in that direction till I descried the sea. I spent ten days in crossing the high trachytic mountains (between 9000 and 10,000 feet approximatively), and I descended by rapid declivities to Kerasun. I shall be able to give the true altitudes when my numerous hypsometrical measures are calculated. From this city, the mother country of the cherry-tree, which Lucullus transported for the first time to Europe, I went to Tripolis (*hodie* Tireboli), whence I ascended the river Marchottchai (which falls into the Black Sea near Tripolis) to Gumuchhane, and pushed on to the south to the town of Erzindjan (called equally Ezingian), situated on the Euphrates, in order to get an uninterrupted section from that classic river to the Black Sea, a section running almost from S. to N., and having a length of near two degrees. From Erzindjan I ascended the Euphrates to its sources near Erzerum. After a stay of ten days in the capital of Armenia, I undertook the exploration of the lofty and perfectly unknown chain (at least to geologists, botanists, and zoologists) which borders to the south the valley of the Euphrates between the meridians of Erzerum and Erzindjan. At any other time the visit to these mountains would have been less difficult than at the present moment, on account of the alarming progress which the predatory Kurdisch tribes are making every day in the whole eastern part of the peninsula; so that, if the Turkish Government does not succeed in stopping their encroachments and in checking their boldness, in a very short time the whole valley of the Euphrates will be in the hands of those classic robbers whose undaunted spirit and ferocity were experienced more than 2000 years ago by Xenophon, when, in his famous retreat of the 10,000 Greeks, he had to cross the country of the *Carduchi*. There is no doubt that one of the reasons which favour their extension and depredations is the increasing weakness of the *sick man* of the

Emperor Nicholas; a man so truly sick indeed that, according to all I had opportunity of observing during ten years, he is certainly very near his last moments, in spite of the galvanic skill of those who pretend to re-animate dead bodies. Independently of this reason, there is at the present moment another, which revealed itself during the last year by the unusual boldness not only of the Kurds of Armenia, but also of their brothers and of the Arabs of Mesopotamia, Bagdad, &c. I have the strongest reason to believe that the Indian insurrection produced an electric impression upon the whole of the Mahometan family; so that, if this insurrection had really succeeded, the consequences of this triumph over England would have been most alarming to Christendom and to the future civilization of the whole continent of Asia. Instead, therefore, of reducing the Indian catastrophe to the petty proportions of the affair of a single nation, and looking at it with the eyes of national jealousy and rivalry, if we consider this important event from a higher and more philosophical point of view, we must necessarily come to the conclusion that all civilized Europe is deeply interested in the success of the British arms in India.

In spite of the great difficulties which the Kurds opposed to my exploration of the large chains of Bingöldagh (literally, "mountain of thousand lacks"), I was, however, so fortunate as to succeed in my enterprise. Nevertheless, I regret very much not to have been able to make the interesting researches you pointed out to me in your last letter (six months ago) at the moment of my departure from Paris for Constantinople, viz., the researches after the remnants of fossil elephants in the country of Mush. When on the Bingöldagh I was certainly very near Mush, and could have descended into that tract by the direct road which goes from Erzerum through the Bingöldagh; but, according to my custom, I always avoid a public road, and prefer finding out a new one for my private and exclusive use. Therefore I intended to turn towards Mush by descending from the Dudjukdagh. Unfortunately, there was no possibility of crossing the country in that direction, for two Kurdish tribes were squabbling there, and waging one against the other a most bloody war. Consequently I should have been obliged to return to the Bingöldagh in order to take there the direct road to Mush. This would have caused me a great loss of time, and, moreover, it would have forced me to cross twice the same dangerous country; whereas before me I had still a large tract of terra-incognita. In consequence, I descended the northern declivity of the lofty ridge which forms the southern boundary of the valley of Euphrates, and returned to Erzindjan, which two months ago I had reached when coming from the opposite side. From Erzindjan I turned eastward, in order to explore the superior course of the river Iris (which, as a glance on my map or on that of Mr. Kiepert will show you, is equally a perfectly unknown region); there, also, I had the unexpected pleasure to meet large parties of my old friends the Kurds. Their presence is by no means calculated to facilitate scientific explorations, and explains the reason why a country situated not very far from the town of Tokat, which is so frequently and so easily visited by European travellers, should have remained till now almost entirely unknown. The valley where the Iris has its sources, and which this river crosses from E. to W.N.W., is one of the most picturesque and fertile tracts of Asia Minor—beautiful forests of the rare species of Quercus ægilops covering a large part of it. The number of villages, however, is very considerable (suffering more or less from the depredations of the Kurds). The valley is bordered on both sides by lofty trachytic mountains, except certain tracts where the declivities of those ridges are covered by large masses of limestone charged with nummulites (generally stratified, and having the strata more or less disturbed). I followed the Iris to Tokat, after having examined the ruins of the celebrated Comana Pontica (near the miserable village Gumek), and then proceeded by

Amasia to Samsun. *Now*, for the first time in four months, I am comfortably settled under a roof (till this moment my tent was my only house), for I am in the house of the English Consul, my old friend, whose hospitality I was accustomed to enjoy during the ten years I rambled through Asia Minor. I had the pleasure to find at Samsun all the ponderous boxes (no less than fourteen, full of minerals, plants, &c.) which I had sent from different points of the countries I had crossed, and I am now occupied in investigating and packing up these glorious trophies, painfully conquered during my adventurous expedition. As soon as this business is finished, and my treasures embarked for Marseilles, I will remount my horse, in order to proceed to Constantinople, following all the zig-zag of the shore. Though this journey will require a ride of at least twenty-five days, I consider it quite a "parti de plaisir," compared with my rambles through the inhospitable countries I have crossed.

Believe me, my dear friend, yours most faithfully,

P. de Tchihatchef.

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3. *Sudden Rise of the Sea at Heligoland.* By Dr. E. Harmsen, m.d.

Communicated by Sir Roderick I. Murchison, &c. &c. &c.

Heligoland, June 16th, 1858.

Requested by the Governor, Major Pattinson, I send a description of a phenomenon that took place in the island of Heligoland, in lat. 54° 145' N., long. 7° 53' E. of Greenwich, on the 5th of June.

At 4·20 P.M. of the above date, during the finest and mildest spring weather, a cloudless sky and the warmest sunshine, the thermometer at 73° F., with a slight breeze from the E.N.E., the sea around this island in the short time of one quarter of a minute rose 6 feet, remaining about 3 minutes at this elevation, and during 10 minutes receded gradually to its former level; no noise or sudden gust of wind accompanied this phenomenon, nor was a wave formed whilst it lasted.

On Sandy Island, situate about a mile from this, the main island, and where the beach rises very gradually, the phenomenon took place under somewhat different circumstances; there the sea did not rise in so unusual a manner, but a large wave approaching from S.E. rolled with great force and speed, as if driven by a gale, towards the shore, where breaking, it ran up the beach a distance of 70 feet. This first large wave was followed by three smaller ones, which meeting each other in the course up and down the beach, created a surf which principally on the reefs of rock was very strong, covering them with foam in a manner as it is seen only during a storm.

At about ¼ past 4 the wind changed to the S.E., and increased to a moderate breeze till 5 o'clock, the time of high-water, the horizon became clouded, and the oppressive heat towards evening made a thunderstorm very probable.

At 8·35 and 8·50 P.M. the phenomenon re-occurred in a similar manner as in the afternoon; in both instances a wave of the height of 5 feet rolled from west to east with great rapidity and noise towards the island; in both instances the large wave was followed by three or four smaller ones. The approaching of all these waves could be observed for two or three minutes, as they, rolling over the far extending reefs of rock, covered them with foam; the wind still blowing a fresh breeze from S.E.

During this, the water rose about 4 feet at the beach of this land, remained so for two minutes, and then in a time of four minutes receded to its former level.

In the course of the night there were no repetitions of the phenomenon, but from 11 P.M. till 3 A.M. a moderate thunderstorm took place, accompanied by some violent gusts of wind, but little rain.

Finally, I have to remark that the barometer stood at 29° 98', and did not show any fluctuation during the phenomenon. The narrative of the phenomenon taking place on the afternoon I have drawn up from materials furnished by pilots and other people at this time on the beach, several of whom were exposed to considerable danger by the sudden, unexpected rising of the water; but of the repetition, during the evening, I was fortunate enough to be myself an eye-witness.

E. Harmsen, M.D.

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4. *Journey from Origstadt to Delagoa Bay, &c.* By Mr. Coqui.

Communicated by **Thomas Baines, Esq., F.R.G.S.**

March 4, 1846.—I left Origstadt with two waggons, our party consisting of five white persons and three Kafirs. We passed at first through a bold mountainous country, with little or no game, and on the 10th began the descent of the Drakensberg, which, running nearly parallel to the coast, stretches from the south to an unknown distance in a northerly direction. From the land there is no perceptible ascent, but the face toward the sea is exceedingly steep and bushy, and though we commenced early, the day was spent before we reached the bottom.

We crossed a fine river, name unknown, flowing N.N.E. along the base of the range, and the next day reached the kraal of the Kafir chief "Mysole," a fine, intelligent-looking man, who for a couple of heifers supplied us with three guides, directing them to point out a path which he said was not infested by the poisonous fly tsetse.

We followed an old track of the emigrant farmers a day farther, and then turned to the right or south. In three or four days more we crossed the "Omguini," a stream 400 yards wide, rising in the Drakensberg and flowing sluggishly to the north-east: its current, indeed, was almost imperceptible. Numbers of canoes were plying on its surface.

We now passed through a hilly and thickly-wooded country, through which we had to cut our way with the axe—in one place particularly for about five miles without intermission. In four days we crossed the second source of the Kamati, which rising also in the Drakensberg, joins the Omguini at the same place where another river flows into it from the northward, and the three then bending south, empty their waters into Delagoa Bay under the name of the Manice, which is not, as Captain Harris supposed, the Limpopo, nor has it any connexion either with that or with the Elephant River. The broad river of Triechard was very probably the junction of these three. Here some of the Kafirs caught the tsetse or fly, and as the guides had evidently failed in finding us a safe passage, we pushed on as speedily as possible to save our cattle from its deadly sting. The country became now more open, the flats were diversified with clumps of bush and a few hills, and tenanted by troops of elephants, one of which we shot, and multitudes of buffaloes, quaggas, gnoos, and nearly every other species of game that in all probability had never before been fired at.

About the 27th we found a large timber forest, with several beautiful springs of clear water, the first we had seen from Origstadt. On the 31st we arrived in the vicinity of Delagoa Bay, somewhat to the southward of the settlement of Lorenzo Marques, and after crossing the Mattol, a stagnant muddy marsh rather than a river, we reached the settlement on the 2nd of April and outspanned on the beach opposite.

The village and fort are situated on a sandy hillock, surrounded at spring-tides by the sea. The fort is only calculated for protection against the natives, and the village contains about 20 houses, inhabited by Portuguese Arabs and Creoles from Goa.

We were well received, and the 4th of April being the birthday of Her Portuguese Majesty, were invited by the Governor to the fête and review. The troops were all black natives of Delagoa, commanded by two European officers: they were in uniform, but seemed to have little notion of military movements.

At the Governor's house I saw a map showing the three rivers flowing from the Drakensberg, then joining and forming the Manice, navigable for 40 miles from its mouth, being marked from 2 to 5 fathoms.

I tried to obtain permission to go up it in a boat; but the Governor seemed to be unfavourable to my doing so, and sickness breaking out among us, I was obliged to give it up. An Englishman, a very skeleton of a man, came to the waggons: he was a deserter, who with five more like himself had left Origstadt for Delagoa, where they were obliged to give up their guns to the Government. His companions had all died of the fever, and he was slowly recovering. Rations were allowed him by the Governor.

On the 7th of April we started on our homeward journey, taking the shorter and more usual road to the eastward of our former route. One of our oxen had already died from the sting of the fly and the effect of the climate. In seven days we reached the Kamati River, having lost half our oxen on the road, and the remaining twelve were too weak to draw the waggons across. The next day three of our number were sick, and the oxen unable to rise. We pitched our tent by the river and sent forward one of our own Kafirs and some natives with a letter to Origstadt for assistance. In two days all the party, Kafirs as well as whites, were sick, except myself; in six days one of the Kafirs died, and was buried. In nine days, when we were expecting help, our letter was brought back by the natives, who said our Kafir had died on the road. Our situation was now truly deplorable: our interpreter was dead, and I was obliged to tend the whole of my helpless companions. The carcases of our oxen (all being now dead) lay round the waggons, emitting an intolerable stench, while wolves howled round us by night and thousands of vultures hovered over us by day, or sat gorged upon our tent after their loathsome banquet—the wolves coming out in open day to join their feast, undisturbed by our feeble efforts to drive them off. We despaired now of ever receiving assistance: yet another Kafir was despatched with the letter, and I did my best to cheer my sinking comrades. In a few days Cobus Snyman died, and I became ill; but as the fever was only violent at night, I was still able, though daily growing weaker, to tend my companions by day. In another week I found Van Helsingden sitting upright in his waggon a corpse, his son sleeping beside him unconscious of his death. Poor fellow! he only survived him one day, and both were buried together.

My father-in-law (Van Breda) and I were now the only survivors. My strength was rapidly failing. The natives could not understand our wants, and were too apathetic to tend us in our sufferings. Our tent had fallen down and we were not able to raise it again, and despairing of other help, I succeeded in hiring about twenty Kafirs to carry us, lying each upon a kadel or waggon-cot frame.

We were carried about four hours when the Kafirs set us down and made a fire for themselves. Scarcely was it kindled when it was extinguished by a flood of rain. Our blankets were drenched, and the water streamed around and beneath us during the whole of this dreadful night. Mr. Breda never spoke afterward. The Kafirs carried us next day about an hour, when they set us down in an open flat with a few stunted bushes, and, though ten pieces of linen and ten of check had been distributed among them, refused to carry us farther. With difficulty they were at length persuaded to resume their burden, and in half an hour brought us to a Kafir kraal, where, for six pieces of linen and some beads, I obtained permission to occupy an old hut, and considered myself fortunate in obtaining a dry and sheltered spot wherein to die. The same afternoon Mr. Broda ceased to breathe, and in the evening the long-expected help arrived. Two young Boers, relatives of one of my deceased companions, brought oxen from Origstadt, and the next morning brought one of the waggons from the Kamati River, leaving the other in charge of a Kafir chief. They committed the remains of my father-in-law to the earth and made all possible haste to Origstadt, which we reached in the beginning of May. I was then unable to walk, stand, or sit, having lived for twenty days upon sugar and water alone.

In the course of two months, by the Divine blessing upon a naturally good constitution, I was able to walk without assistance and without having undergone any regular course of medicine; but it was nearly a year before I fully recovered from my illness. My experience will deter me from ever visiting Delagoa again, and I trust that this narrative will have the effect of dissuading others.

5. *Abstract of Notes on the Limpopo.* By DR. W. WAY, M.D.

DR. WAY states the result of inquiries made at Zout Pans Berg, about the lower course of the Limpopo. This village is the emporium of a considerable commerce, and is also a kind of Alsatia for refugees from the laws of the Cape Colonies and the adjoining territories. There are many inhabitants who have means of obtaining considerable knowledge of distant localities. Dr. Way's conclusions are based upon the information given by one of these men, combined with that of two Portuguese traders from Delagoa Bay; they are to the effect that the Limpopo reaches the sea at a point midway between Delagoa Bay and Inhambane, and is there called the "Bembe." Its position corresponds with that marked Inhampura on the maps.—F. G.

6. *On Chinese Notions of their own Great Rivers.* By JOSEPH EDKINS, Esq.

Communicated by SIR RODERICK I. MURCHISON, &c. &c. &c.

THE Chinese have accounts in their books of the changes that have occurred in their great rivers for many ages back. They have in modern times made minute researches into the topography of ancient China to illustrate the books of the classical period. The sites of old cities and the old boundaries of kingdoms and provinces, with alterations in the course of rivers, have all been carefully investigated for the better understanding of the classics.

The alluvial plain in which Shanghae and Suchow are situated is represented in maps by native scholars as an extensive delta, through which the Yang-tse-keang formerly poured its waters by three mouths to the sea. One mouth was at Hangchow, the southernmost point in the plain. Another arm of the river, passing through the lake Taehu, proceeded along the Wusung-keang from Suchow to Shanghae, and entered the sea at Wusung. The third was identical with the present embouchure. The old Wusung river, that always led from Suchow to Shanghae, is now become shallow and narrow in many parts. It was formerly a river of much greater magnitude than at present.

Much of the carrying trade in boats between Suchow and Shanghae is now done by the Hwang-pu river, a stream that passes the city of Shanghae from the south, and immediately afterwards enters the Wusung river. Before bending north to Shanghae the Hwang-pu river has an easterly course, and it assists in carrying the superfluous waters of the Taehu, with which it is connected by other streams and by lakes, to the sea. Changes in the water channels in this delta have been studied by native scholars, not only for the illustration of ancient topography, but for the assistance of government officers in regulating the system of embankments and canals, and generally in comprehending the physical features of the country. I have no opportunity, while in England, of referring to such native works as would mark out the course taken by the two old branches of the Yang-tse-keang before reaching the Taehu and Hangchow. There is a strong stone breakwater and embankment constructed along the north coast of the Hangchow Bay nearly to Shanghae to keep out the sea. No streams are allowed to enter the ocean through this embankment, because a salt-water tide would force its way up the channels by which they flowed, to the injury of the rich plain behind. All the waters of this district enter the sea ultimately by the Yang-tse-keang, whose vast volume of water causes a fresh-water tide to flow into all its tributaries, even those nearest the sea. If the communication between the Hangchow Bay and the Yang-tse-keang had been allowed to remain, the agriculture of that rich district would have been affected by the intrusion of sea water. To prevent this was the object of the system of embankments, which helped to bring the river and the country adjoining it to their present state.

The channel of the Yellow River, or Hwang-ho, which has been recently left dry, was formerly the bed of another river, the Hwei, flowing by Fung-yang-fu into the sea, between the Yang tse and the Hwang-ho. This latter river has always been accustomed to change its embouchure once in two or three centuries. In recently seeking a path to the sea in a more northerly latitude, it has been making an effort to return to its original course. I have seen, in a critical work on the Yu-kung, five or six maps representing the path pursued by the river at as many epochs from the Han dynasty, coeval with the Christian era, till the present time. Sometimes it reached the sea to the north of Shantung promontory, at other times to the south of it. The section of the Shoo-king (Book of History) called Yu-kung consists of a geographical description of China in the time of the Emperor Yu. It details what was done by that famous ruler, about two thousand years before Christ, in restoring the country to a condition fit for agriculture after a local deluge. In this remarkable fragment the names are extremely antique, and there is room for much research in discovering the localities of ancient towns and the former courses of the rivers. Many works have been published on this subject; for example, the one just referred to.

The most remarkable feature in the Shoo-king is the scientific character of its commencing chapters. It is a book made up of fragments written in different periods. Its principal divisions are the respective histories of the five dynasties, Tang, Yu, Hea, Shang, and Chow. The most important portions for science are that of Tang, containing the early Chinese astronomy, and the commencement of the history of the Hea dynasty, viz. Yu-kung, the very valuable fragment on Chinese geography just referred to.

Note.—Mr. Edkins, in his paper on the ancient courses of the great rivers of China, has touched upon a point of great importance to physical geography.

There is probably no other part of the world where records of so early a date and such good authority are to be obtained with reference to the detritus of large rivers as in the annals of the Chinese empire. It is therefore to be hoped that Mr. Edkins will pursue his inquiries on his return to China, and forward to the Society the result of his labours upon so important a subject.—R. C.

7. *Account of a Visit to the King of Búr Sin, 64 miles to the North of the Gambia.* By Col. LUKE SMYTH O'CONNOR, C.B., F.R.G.S.

Communicated by the COLONIAL OFFICE.

Government House, Bathurst, Gambia, 24th January, 1859.

SIR,—I have the honour to transmit a treaty of amity and commerce entered into by me with "Bucarie Chillas," King of "Búr Sin," at his Majesty's seaport "Joal," on the 22nd instant.

The 23rd of December special messengers arrived at Bathurst bearing a letter from the King of "Búr Sin," and a request that I would meet him at Joal, "where he would wait my arrival."

I arranged to leave in her Majesty's colonial steamer *Dover* the 3rd of January, but a report of the Mahometans of Combo assembling at the King of Jambool's induced me to tarry until the 23rd instant, when I proceeded to Joal, situated 64 miles north of Bathurst, and about 26 south of Gorée.

A deep shallow bay indents the coast from the Red Bank (fatal to so many vessels) to Joal, which cannot be approached nearer than 3 miles by ships drawing more than 8 feet of water.

At particular seasons of the year, and when the wind blows on shore, the fearful rollers and a heavy surf render either disembarking or embarking impossible, and any unlucky craft once embayed becomes a wreck, which the natives seize upon, plunder the cargo, break up the vessel, even to the last copper bolt, and carry away the crew into the interior, no matter of what nation or complexion they may be.

In January, 1853, Captain Barron, of the United States sloop of war *Jermytown*, visited me at Bathurst, having been at Joal *to demand* restitution of an American ship which had been wrecked and thus summarily treated; but as he quaintly remarked, "'A pretty demand!' the king and chiefs said; "God had sent them the vessel and cargo; the white people were at some short distance, and, being useless, would be given up to their countrymen."

Captain Barron's view was correct; you might land an army at Joal, and, unless the natives chose to accede to your request, "*all demands*" would be futile, for they have only to withdraw to the desert, and leave climate, fatigue, and drought to combat for them.

I therefore deemed it a very desirable object to meet half-way the king's propositions—

"To open trade between Sin and Gambia, to secure and protect all vessels and persons wrecked on his shores:" and I have had the satisfaction of being the first English, if not European Governor, who ever visited this wild and singular people; but, what is of far more importance to the cause of humanity and civilization, accomplished every object I desired in making the treaty.

Having anchored off Joal on the evening of the 21st instant, I despatched the king's messengers, my own interpreter, and Massara, the chief of the Gambia Mahometans, and a native of Búr Sin, to pay my respects to the king, who returned his "compliments and thanks for my visit, he having stood on the beach five weeks to receive me, and that three canoes would be with me in the morning for my people."

I landed on the 22nd at 10 o'clock, accompanied by Mr. Fenton, Acting Chief Justice; Mr. Chown, a Bathurst merchant; Lieutenant O'Shaughnessy, and 14 men of the 2nd and 3rd West India regiments as a guard, more for display than necessity.

A shelving shore of rocks and thick fetid mud covered with seaweed trends inwards. The strand was covered with natives of all ages, perfectly astonished at our appearance, but quiet and orderly; certain headmen received me in the most friendly manner and led the way to Joal.

The king sent word "he was not yet dressed—he did not expect me so early." After some delay his Majesty came with drums, singing men proclaiming his power, and surrounded by a numerous body of followers armed with French and foreign guns, spears, and swords; a large circle of densely-packed natives sat on the ground, and the palaver commenced.

Bucarie Chillas is not more than 22 years of age, fully 6 feet 4 in height, of powerful, athletic frame, independent, haughty manner, of a pleasing countenance, and seemingly enlightened and decided disposition. He spoke entirely for himself, made no appeal to his headmen, and discussed with very singular clearness and acuteness the several clauses of the proposed treaty. His Majesty remarked, "the main object was to have traders accredited from me to his country: all with 'my book' claimed his protection; but wanderers (vagabonds) and people who came to Joal, paid no custom, and sold their goods to whoever chose to purchase, had no right to demand redress from the king if insulted." He objected to a *fixed tariff*, as is the case with Demba Sonko, King of Barra, because "the trader bringing a can of rum ought not to pay to the king the same duty as another man bringing a hogshead, or one bringing a few heads of tobacco pay the same as the man with a cargo of goods, but the king required custom in proportion to the stock for sale."

"Our vessels and mariners wrecked to receive protection, notice being sent to me or to the Governor of Gorée."

The clause, "All traders to behave orderly and respect the laws of Búr Sin," met with general approbation.

His Majesty was vastly pleased with the soldiers—the first regular troops he had ever seen—particularly with the firelock exercise, marching, a few simple movements, and the *firing*. He requested "I would suffer my men to sit down, as they must be tired standing;" which I informed him was never permitted on duty. When he accompanied me to the beach (a mark of especial favour) his Majesty presented the guard with two bullocks.

Prior to embarking I called on three French Missionaries who lead a dreary, precarious life, tolerated, but not encouraged; the king "requested I would not visit the French until I had seen him," and subsequently informed me that they wanted a grant of land as *a right*, but this he was resolved not to concede to them. His Majesty is evidently keenly jealous of any foreign settlement being made in his territory.

After sunset a salute from heavy buccaneer (elephant) guns was fired from the shore in honour of the treaty, and returned by the *Dover* with seven carronades. When the last boat came off, three bullocks, presents, were left on the strand; but I had not time, nor, indeed, the means, to fetch them to the steamer.

"Búr Sin," the northern boundary of the extensive kingdom of "Búr Sallum" (visited by me in May, 1854), divides it from the wild tribes of "Bowals," "Syrias," and "Lebous." There is no correct survey or any accurate knowledge of the interior of the country, its extent or resources, but the natives always have been, and are, a source of terror to all mariners and traders coasting from Senegal to the south.

The Syrias (or Sarreres) frequenting Bathurst, many of whom engaged, in my irregular contingent, against the Mahometan rebels of Combo in July and August last, acknowledge Bucarie Chillas as their king.

The men of Búr Sin are tall, muscular, warlike in appearance, manner, and gait, of a deep black colour, not marked or tattooed; they wear gre-gris, and believe in the "fetish." To me they seemed a finer and more civilised men than the people of "Búr Sallum."

The women are tall, full, well made, with small high features, thin lips, and sparkling eyes, and, judging from the swarms of children, most prolific; they performed a native dance in compliment to me, wild enough, and with gestures and movements most obscene and indecent, exceeding any I had ever witnessed before in Africa. The "Sin" women, like their "Sallum" neighbours, are celebrated for their good looks and licentiousness.

The exports from "Bür Sin" are gum, corn, rice, ground-nuts in small quantities, lime, cattle, hides, ivory. A Bathurst merchant received recently from Joal two elephants' teeth, each weighing 56 lbs.; but commerce might be vastly increased if a friendly feeling was cultivated and secured.

Cattle, so much wanted in Bathurst, could be conveyed in droghers or canoes, or driven overland through Sallum and Barra. African kings require their produce to be sent for; they say, "We have no time or people to spare."

The king resides in the interior, and pays a brief annual visit to Joal to regulate the trade and customs; on leaving for his capital, the huts occupied by his Majesty and followers are *burned*, as no subject is worthy to occupy them.

One superstitious custom seems worthy of mention: in a group of trees on the shore, 3 miles from Joal, stands a gigantic "baobab," or monkey bread-tree (a landmark seen many miles at sea, which, if we credit Humboldt and other savans, may be coeval with those ancient denizens of the Senegal forests, upwards of *five thousand years old*). If the effigy, or a portion of the garment, of any obnoxious person is put in this tree, and certain heathen rites performed, the individual bewitched wastes away by slow degrees, and finally perishes.

Nor is this absurd idea confined to the Africans, but implicitly believed by many French and British Jolloff families, who employ a messenger to undo the incantation and remove the curse. I was gravely assured, with every appearance of reliance in the truth of the story, a family named Vincent, of "Gorée," died one after another from the influence of the great gregris-tree.

I will no longer trespass on your time or attention by entering into any more diffuse detail of this very interesting and, I love to hope, beneficial expedition: still, permit me to observe, the treaty I have made *in no way* compromises her Majesty's Government, or involves more or less any responsibility: *it is purely and solely a commercial and humane convention*, one I trust likely to insure protection and security to all traders, European or American, who may be unfortunately driven on the shores of "Bür Sin."

The Right Hon. H. Labouchere,
&c. &c.

I have, &c.,
L. SMYTH O'CONNOR.

8. *Notes on an Expedition down the Western Coast of Africa to the "Bijuga Islands," and the recently discovered river Kittafiny.* By Colonel L. SMYTH O'CONNOR, C.B., F.R.G.S.

Communicated by the COLONIAL OFFICE.

Government House, Bathurst, Gambia,
25th January, 1858.

SIR,—In connexion with my Despatch, 22nd December, 1857, I have now the honour to transmit herewith a detailed Report of my recent Geographical Expedition down the coast to the "Bijuga Islands," and to a certain extent up the "Kittafiny River," the supposed stronghold of a large slave-dealing establishment.

The second day after leaving Bathurst, the 16th November, I ran up the "Jeba river" to "Bissao," to call on the Governor, M. Honorio Barretto, and thank him for the support and protection he recently afforded to a British trader who died at "Bissao:" his Excellency subsequently securing his effects, papers, and goods, and forwarding them to the owners at Bathurst.

"Bissao," declining when I visited it last in April, 1855, has since then greatly deteriorated in trade and appearance. The old buildings, totally neglected, are sinking into ruins, the troops without barracks living in miserable mud huts, the port occupied by only a few colonial and coasting vessels, the market scantily supplied with the commonest necessaries of life, are indubitable evidences that the power and prestige of Portugal are rapidly on the wane in this part of the world.

Passing the island of "Bulama," I reached the entrance of the "Rio Grande," which well deserves its name as the finest stream between the "Gambia" and the "Bight of Benin," capable of being made a great highway to the interior, and the means of opening a trade with the natives.

On the right-hand bank, called "Bessassema," are two settlements: one cultivated by a Frenchman, M. Henrique Orteau; the other a small location belonging to a vagrant English subject named Lawrence.

The bank and grounds at "Bessassema" are cleared to a considerable distance; of a rich alluvial soil, they produce corn, kus, rice, ground-nuts, sugar-cane, yams, potatoes, vegetables, tropical and *European* fruits, flowers in abundance.

M. Henrique Orteau employs about 300 natives; has a well-built open town: the huts, very lofty, with thick mud walls, and broad piazzas, are admirably calculated for the climate. He represented the place as healthy, and that even in the rainy season fevers seldom or never prevailed.

Having mentioned my intention to revisit "Kanabac," attempt to reach and land at "Orango," and then try for and explore the "Kittafiny river," M. Orteau, who has wandered about in the adjacent countries, the "Bijugas," and in the neighbourhood of the "Kittafiny" for years, most courteously offered to accompany me and afford his valuable experience in piloting the steamer.

We ascended the "Rio Grande" to a considerable distance: the banks are in many places very lofty, open, and the country adjacent to them fertile, undulating and picturesque, presenting numerous well adapted situations to establish factories where now are only a few solitary huts of the ivory hunters and small traders. The "Biafaras" inhabit the north side of the "Rio Grande," and possess the districts of "Ginhala" and "Bijuba."

Resembling the "Balantes" of the river "Geves," they are industrious, active, warlike, trade with their neighbours in rice, maize, poultry, oxen, but never traffic in slaves. They never contract marriages out of their own country or permit strangers to enter it. Gold-mines are said to exist in this territory, about twelve leagues in length; but the most simple, available, and certain opening for commerce would be ivory, wax, hides, corn, ground-nuts, and the various productions of the interior portion of the country, in exchange for British manufactures. Crossing the "Jambeer" channel to "Kanabac," I found that the king with his people were at a neighbouring island collecting rice. I sent my chief interpreter, Mr. Daniel Sleight, and his Majesty with a few chiefs and old men came on board the steamer at 4 o'clock in the morning, and waited patiently for me until daylight. He expressed great satisfaction at seeing me again, and exhibited the military chaco I gave him in 1855, which with a native pagne or cloth round his loins constituted the royal apparel. I landed at noon and walked three miles to the king's chief town, accompanied by my wife, the first European female that ever trod the land of "Kanabac."

It is needless for me to enter into a detailed statement of "Kanabac," its appearance, productions, resources, inhabitants, having been fully described in my despatch, 22nd May, 1855, which, with other communications, was read before the Royal G[illegible]raphical Society. I remained two days with the king, and attended a great torchlight meeting on an adjacent island, given by the king, chiefs, and natives, in honour of my visit to them.

These are the people described by travellers as "the Bissagos or Bijugas, tall, resolute, robust—and adorn their houses with the scalps of their enemies. Impatient of slavery, they murder themselves on receiving an affront; intrepid in war, they are believed to be sprung from the terrible Gingas or Jagas." At daylight next morning, the 22nd November, we ran along the picturesque shores of "Kanabac," steering in the direction of "Orango." Great caution was necessary, as this portion of the channel remains unsurveyed. Looking at the charts it will be found that this part presents a blank; and although a few haphazard soundings are laid down near "Orango," the way to it, the depth of the channel, the shoals, the soundings are unknown,—in fact, an American privateer, quasi pirate, and a French schooner, quasi slaver, are the only vessels stated to have approached the island, both anchoring at a safe and civil distance from fear of the natives. The channel is surrounded by several of the "Bijuga" islands, "Bonlack" or "Bawack," "Isle de Chionga," "Chionga Endoulioq," "Houran," "Hune," on which no white man has as yet ventured to land, nor would it be prudent to attempt it. Although the steamer was conducted with the greatest circumspection, and at half speed, the lead constantly sounding, we grounded on a bank, the depth having varied from eleven to one fathom.

The tide falling, we saw nothing but extensive banks of thick blue slimy mud, and the real channel not 100 feet from us. A large portion of the shores and bluffs of "Orango" looming in the distance, I consulted with M. Orteau, and I despatched him, my interpreter, two natives of "Rio Grande" that had before been at "Orango," and two of my own crew, in a whale-boat, giving them a small present for the king. After an absence of twenty-four hours they returned bringing the king's head pilot, with a bullock and most friendly message from his Majesty, and the steamer hove off and afloat in eleven fathoms. We pushed on through a most tortuous channel to "Point Orango" along the south-west coast, and towards evening anchored in a spacious harbour opposite the landing place to the king's town, in 11° 12" north latitude, and 16° 08" west longitude, in three fathoms water with soft mud bottom. We disembarked the following forenoon amidst an immense crowd of the natives, tall, muscular, finely formed men, of handsome feature and jet black complexion, their only clothing a clout of deer or goat skin, passing between the fork and round the loins. A few were armed with rude spears having one, two, and three blades,—the last like the ancient tridents; the chiefs carried swords, the blade Portuguese make, with the words engraved on it, "Draw me with honour, and sheath me not in disgrace;" but clumsy wooden handles studded with nails, and coarse skin or leather scabbards, showed they had been for a long time in the islanders' possession.

We marched on surrounded by a wild, motley, but most orderly escort, who seemed lost in amazement at our appearance. The ascent was gradual along a broad path, passing through extensive prairies, rice and maize farms, pasture lands, crowded, literally crowded, with herds of the finest, fattest, and handsomest cattle I have seen in Africa. A numerous party of women in Indian file, carrying baskets of rice and corn towards the town, encountering us, appeared paralyzed, but soon recovered and came dancing towards the white females, who evidently engrossed their admiration and attention more than we did; they examined particularly my wife's hair and gloves, considering the latter a second skin. After a walk of two miles the king's town was visible on a comparatively lofty hill. Passing through a narrow path slightly fenced in, we came to the principal street, which, like those we saw afterwards, was broad, *clean*, and open; the houses or huts very large and lofty, some fully seventy feet in length, others double that dimension in circumference, with conical roofs. A rude battery of ship's cannon, of various nations, calibres, and dates,—many very old; a singular building, having a tower or turret at each end,—the king's warehouse; and a loopholed building, the common prison, attracted our attention.

We were told that a sorceress was confined in the last for having bewitched one of the king's sons (his Majesty enjoys the reputation of being the father of sixty), and caused an alligator to bite off the prince's leg while bathing, from which he died.

At last we reached an open square, shaded by fine trees, and were conducted to the king's house, or rather a spacious piazza, rudely made and covered with palmetto leaves, in front of the royal residence. The walls were of wood, singularly carved, perforated and painted; the roof of *tiles*; and strewed about in wild confusion, or piled in heaps, lay relics of vessels, figure-heads, anchors, tackle, chains, ropes, furniture, pictures, European implements; among other strange articles a life-buoy of the latest improved construction,—melancholy tell-tales of shipwreck, bloodshed, and plunder.

The king holds absolute power over the properties, liberties, and lives of all his subjects, from the highest chief to the lowest slave. No one can receive a present, trade, cultivate ground, move to any distance, or leave the island without the royal permission: there is no appeal from it, and he ordered his eldest son, "O'Toomnea," to be confined and shot for coming intoxicated with palm wine and creating a disturbance in his father's presence before the "white faces." King Nococesar is an unqualified miser, hoards up all his plunder and presents in a depôt full of merchandise, wines, liquors, confectionery, gold and silver coins of various nations, *plate* silver and *gold*, cloths, uniforms, many going to destruction from not being used; so that at his death a great civil war is likely to take place among the several claimants to the royal treasure. At the king's demise his eldest wife is killed and buried in the same grave with her husband, and a large supply of corn, rice, oil, palm wine, and fruit to feed them on their journey to the next world.

Chairs were prepared for us under the verandah, the chiefs, king's sons and wives forming a wondering circle round. The women, immensely gross, heavy, and handsome, wear a girdle of grass or palm fibre round their loins, and occasionally another on their necks, which when it falls down conceals the upper part of their persons; their thighs and legs are finely formed and turned, but of dimensions unknown in Europe, and such as fully entitle them to bear off the palm of African beauty. Their children are goodlooking, but sadly disfigured with red or yellow paint on the foreheads and over their heads.

The king came to the palaver without the usual noise of tomtoms, singing men, and barbarous music; he shook us by the hand and sat down on a small stool opposite to me. Nococesar in appearance is old, infirm, filthy, and crafty looking; in manner peremptory, decided, overbearing, but cautious, cool, and cunning. He opened the palaver by bemoaning his poverty: "That he was a very poor man (the miser's usual cant); that he was a child to me (he meant in worldly affairs); that I was a great and rich king (all governors are styled kings);" and speaking, as the Africans are wont, in parables, said, "A river of sweet waters, flowing from a distant country, fertilizes the desert and the plain; it makes the corn, rice, maize, ground-nuts, yams, plantains, fruit, grass to grow; so a man with a good name, the messengers of the winds carry it far and wide, and the people are glad to get the heat of his face. I heard of you that you were at 'Kanabac' many moons ago, and I am glad to see you, and let us open trade." Speaking of various other matters, he said, "When I lie down in the night I think there must be a great God over the world, who makes the small grain planted in the ground to yield a vast increase." I was especially struck with this remark. Various figures of singular and disgusting appearance were carried before, in rear, and about the king; four images resembling monkeys, dressed in a brazen bowl, were placed always at his side; and a favourite slave with a bag of gre-gres sat at the king's back. To have touched any of these idols would have been death.

Intimating a wish to end the palaver and give my presents, the king ordered the old man to make the gre-gre to ensure that all should prove fortunate for us. We were collected in a circle in front of a building that turned out to be the temple. A white cock was brought in by an old chief and handed to the priest in the temple, who returned the bird. Another chief caused the cock to peck the idols, particularly the monkey images, and then cut off his head and flung the body on the ground, which, struggling and fluttering round, at last died at my wife's feet, sprinkling her dress with blood; this was universally hailed as a most fortunate omen. We adjourned to another palaver-place and distributed the presents. The cost of these paid to the merchant by government might amount to about 20*l.*, but if used in trade at "Orango" would have fetched from 500*l.* to 600*l.*

After almost endless expressions of friendship, we took our leave of King Nececsar, who, feeble as he was, accompanied us to the boundary of his town, the highest mark of friendship and respect. Escorted by a multitude of the natives we reached the beach, and were received and welcomed by "Oronto," the prince next in succession to the crown, which does not descend from father to son.

The following forenoon the king and chiefs came on board the steamer in large war canoes, capable of carrying one hundred paddlers. Each canoe had a large carved figure-head of a sea-horse, an ox, or a bull with immense horns, and an ornamental wheel at the stern. The "Orango" islanders use their paddles like oars, spring up and sink on the bench at each stroke, and appeared to me the most skilful rowers on the coast. Although the king and chiefs had never seen, much less been on board a steamer, little surprise was exhibited by them, but their followers were astonished with the machinery, and the paddle wheels were evidently a source of vast wonder—"the big canoe's feet." The king went over the steamer, examining minutely every portion of it, and measured the deck with a spear. His Majesty sang the old song of poverty, was most anxious I should stay for four or five days, repeatedly promised me *to protect all white men who were wrecked on his shores or came to trade*, presented me with a *white* bullock as the emblem of peace, and my wife with a singular cow, not forty inches high. His Majesty took his departure under a salute of seven guns. Next morning five bullocks were sent on board as a present, and we cleared the dangerous channel and anchored before sunset.

In my humble opinion this visit to "Orango" may hereafter be productive of some importance. It pioneers a channel hitherto not attempted, disabuses the long and universally circulated report of all travellers,—"That the Bissagoes were the most ferocious savages, cannibals not to be approached or trusted; that no social intercourse could be held with them; and as to commercial reciprocity, such a desperate and hazardous proceeding could never be attempted." It proved to the most powerful king of the "Bijuga" islands (for "Orango" is double in extent, population, and influence any of the other numerous clusters) that the white man did not fear him or his people.

Last, not least, by exhibiting articles of civilized society attainable frequently and easily by the means of fair barter, instead of the sometimes difficult and precarious chances arising from shipwreck and plunder, it induced the belief it would be his interest and the interest of his subjects to exchange with the white traders the various superfluous productions of their fertile and fruitful island—ivory, oxen, hides, wax, corn, maize, ground-nuts, poultry, and a long catalogue of various other native articles—instead of having them useless, rotting, or hoarded up in the general receiving-house of their avaricious and tyrannical sovereign.

There is clay well suited for making bricks or tiles, and the gurglets for water—rude, but porous—are better adapted to tropical countries than those manufactured in England. Carving in bone and ivory, dressing leather, are already practised by the "Orangoes." Palm-trees for oil and forests of valuable timber abound all over the island. The finest oxen are wild in innumerable herds, but, singular enough, horses and asses are not known to the "Bissagoes."

Rice could be purchased at about 3*l*. a ton (I mean in trade), which would sell at Gambia or at Sierra Leone at from 16*l*. to 25*l*. In fine, I have no doubt but the following passage in the Travels of that extraordinary, enterprising, and high-minded man Dr. Livingstone, related of the "Batuana" on the Lake Ngami, is equally applicable to the "Bijuga" islanders and many other tribes of Western Africa: "A trader who accompanied us was then purchasing ivory at the rate of *ten* good large tusks for a musket worth *thirteen shillings*. They were called 'bones,' and I myself saw eight instances in which the tusks had been left to rot with the other bones where the elephant fell. The Batuana never had a chance of a market before, *but in less than two years after our discovery not a man of them could be found who was not keenly alive to the great value of the article*."

The teeth of the elephant in South Africa are considerably larger than those of Western Africa, and the ten teeth may be fairly averaged at 90lbs. each, or 900 dollars: equal to 187*l*. 10*s*. "for a musket worth 13*s*." Give the "Bissagoes" and other tribes "the chance of a market, and they will soon be found keenly alive to the great value of the article."

In a despatch, reporting my geographical expedition down the coast in 1855, I stated, "to ensure British power, to increase British commerce, to secure British interests, to make some substantial advance in that so long desired but still so unfulfilled object, the civilization of Western Africa, a chain of settlements must be established along the coast." Subsequent expeditions and increased experience have confirmed me in this opinion.

Bulama, in N. lat. 11°, and W. long. 15°, is admirably situated to form a settlement from its central position, proximity to the Gambia, Jeba, Rio Grande, Nunez Rivers, Bijuga islands, and commanding the entrance to the Orango and Jambeer channels. The island is about 18 miles in length and, in some places, the same in breadth. The land, trending gradually from the shore towards the centre of the island, rises to about 110 feet above the level of the sea. The soil is rich, and capable of yielding every kind of tropical production. Fine timber grows in forests; but since 1792, when the unfortunate but indefatigable Captain Beaver made his first and last attempt to establish a colony on it, until he was forced to abandon the undertaking in 1793, Bulama seems to have been almost forgotten or totally neglected by its *lawful owners*, the British Government, to whom it was ceded "*for ever* by the King of Kanabac, the 29th of June, 1792; the island of Arcas and the land on the adjacent continent being obtained from the Kings of Ghinala the 3rd of August, 1792."

Abandoned by the British, the Portuguese availed themselves of the opportunity to convert Bulama into a depôt for slaves; and even after the abolition of that infamous and unholy traffic, the few desperate adventurers who still perseveringly continued surreptitiously, or with the secret connivance of their Government, to carry on the slave-trade, used Bulama to facilitate their purpose. The residence and barracoons of the last of this band, Kittan, still remain, and when I visited Bulama in 1855 a Portuguese Jew resided there as agent for Kittan's widow, trading in rice and ground-nuts. From time to time the Portuguese Government have set forth a claim to Bulama. In 1843 the Governor of Bissao landed a party of soldiers on the island, and hauled down the British flag. The island having been taken formal possession of for the Crown of England by Lieutenant Lapidge, of Her Majesty's brig *Pantaloon*, on the 24th of May, 1842, several naval officers reported a strong military force would be necessary to protect British settlers at Bulama and to resist the attacks of the Kanabac islanders. It is manifest, from my several despatches, that the latter danger is no longer to be apprehended. The Bissagoes have no disposition to enter into hostilities with the British: on the contrary, they are most desirous to be on friendly terms with us; the King of Orango anxiously wishes to have the British flag in his harbour. They "*only require a market*," the opportunity to get rid of their superfluous productions in exchange for the common necessaries of European existence, and, in the words of Livingstone, "they will be found keenly alive to the great value of every article of commerce."

I have, &c.,

L. SMYTH O'CONNOR, Governor.

The Right Hon. H. Labouchere,
&c. &c.

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9. *Asie Mineure: Description Physique, Statistique, et Archéologique de cette Contrée.* Par P. DE TCHIHATCHEF, Hon. F.R.G.S. First and Second Parts. 8vo. Paris: Gide et J. Baudry, 1853.

THIS work, which is quoted in several places by Ritter, consists of two large volumes, and is illustrated by a map, which is very copious in its physical geography, and for the accuracy of which the author professes himself to be greatly indebted to the astronomical observations of M. Wroutchenko, that have enabled him to correct the positions of M. Kiepert. In the first volume, or part, after a disquisition on the origin of the terms Asia, Asia Minor, and Anatolia, M. de Tchihatchef treats of the general configuration of the peninsula, and successively of its coasts and seas, capes and gulfs, lakes, rivers, mineral springs, mountains, and plains. From this part of the work the following passage is extracted, which relates to a region amongst the most famous on the earth, and which has a perpetual interest for the student of history and antiquity:—

"The learned researches of M. Chevalier, to whom belongs the incontestable merit of having discovered the true position of the *Ilium of* Homer, have proved that in the time of Strabo the names of Scamander and Simois had completely lost the signification which they had had in Homer's time, for Strabo places the Simois to the east of the Scamander, which proves that it was one of the branches of the Dombrek or the Kalifatly-chai of the present day, which he designates by that name, notwithstanding that he makes the Scamander come from Mount Ida, whence Homer states that the Simois descends, placing, on the contrary, the Scamander to the south of the Simois, and its origin in the warm springs close to the side of the ancient Troy. It is evident that the Scamander of Homer can only be the Bunarbashi-su of modern time, and his Simois the Mendere-su. The modern name of the Mendere, which is obviously only a corruption of the word Scamander, or Scamandre, proves that the Simois of Homer had become generally known under the erroneous name given to it by Strabo. The confusion seems to have increased more and more, since Vibius Sequester even stated that the Meander and the Simois fell into the Propontis. The geographer Plutarch, who wrote in the second century of our era, employs the two names in the same sense as

Strabo, for he places Mount Ida beside the Scamander, which proves that he meant to speak of the Mendere-su of our day, or the Simois of Homer."—p. 223.

It will be recollected that in the twelfth volume of the Journal of the Society is an elaborate Paper on the Topography of Troy, by Dr. Forchhammer, accompanied by a map of the rivers of its plain, made by Mr. (now Capt.) Spratt, R.N. It may be remarked *in limine*, that, on a careful comparison of the maps and descriptions in the two separate sources of information, it appears that the views and opinions of the two authors, with respect to the identity of the rivers so celebrated in the immortal work of Homer, are strikingly consistent.

The second portion of the work of M. Tchihatchef is devoted to the climatology and zoology; and in the preface we are promised two succeeding parts—on the geology, and on the statistics, political history, and archæology of Asia Minor. The work, so far as already published, is enriched with engravings, displaying striking natural features of the country, and the animals native in the peninsula. The writing is elevated in its tone, close and correct as to style, and there can be no doubt that this will take its place as a standard work of literature.

10. *The Indus and its Provinces: their Political Importance considered in connexion with improved means of Communication.* By W. P. Andrew, Esq., F.R.G.S. 8vo. London: Allen.

This book is written with a view to advocate the interests of the Company engaged in the formation of the Scinde and Punjab Railways; and it explains the directions which those lines of transit are to take, and the benefits capable of being derived from their completion. It is illustrated by a very good map. The scheme for effecting railway and steam communication between the countries on the Indus is the following:—A railway, 110 miles in length, is stated to be in course of formation between Kurrachee and Hyderabad, a contract for its construction having been concluded in December 1858. It is also stated that the Company has been requested by the local authorities "to survey two branch lines—the one from Sukkur by Shikarpoor to Jacobabad, southward from Hyderabad, by Omercote to Deesa, so as to effect a direct communication between Kurrachee and Bombay by a junction with the intended extension of the Bombay and Baroda line to Deesa." From Hyderabad there is a permanently open navigation of the Indus, the Punjund, and the Chenab rivers for 570 miles up to Mooltan, on which waters it is proposed to establish a steam flotilla; and from Mooltan the Punjab railway, 248 miles in length, would proceed to Lahore and Umritsir. From Lahore a branch is projected to sweep across the upper portion of the Punjab to Peshawur, on the frontier of Afghanistan. We learn that on Jan. 27th last the East India Company sanctioned the raising of a million and a half sterling for the commencement of the Punjab railway.

The book is full of quotations of both official and non-official character, indicating the commercial and military advantages which would arise from the construction of the foregoing works. The Indus is certainly the key to Central Asia west of the Himalaya mountains, and the possession of commercial superiority there is adapted materially to counterbalance the commercial traffic carried on inland between the upper Indus and the Bosphorus and southern territories of Russia. Such railways as are projected on the Indus are, as the author argues, necessary in order to enable us to compete with the facilities of transit about to be afforded by the extension of railways in the southern provinces of the Russian empire. On the continuous advance of Russia into Central Asia the author quotes Mr. Ferrier, to the effect that, after having descended the Ural River to the Caspian Sea, and reached the mouth of the Embah, the Russians ascended that river to the point at which, turning south, it approaches the Aral Sea. "Here they have established a military colony, and dug wells at short distances in the desert between the Embah and the sea; they have also placed around these wells settlements of Cossacks, who cultivate the soil in the neighbourhood, so that in a few years an army will be able to obtain sufficient food and forage in all their encampments, and will reach the Aral without serious difficulty. Two other lines of wells have been also dug by the Russians—one on leaving the river Ourloo Irghiz, tending towards the northern end of the Aral Sea; the other commences from two points, Ming-Kishlak and Dash-Killeh, on the eastern shore of the Caspian, which unite half way in one line thence, laid down in the direction of Khiva."—p. 16.

Further on he adds, from the Warsaw journal the 'Czar,' of Nov. 30th, 1856:—"The Orenburg *corps d'armée* has been considerably reinforced. The outposts of this corps extend to the very limits of the country of Turan, upon the rivers Oxus and Jaxartes; and the military flotilla of the Lake of Aral, placed under the orders of the same general, is brought by the above-mentioned rivers to the frontiers of India. On another side great activity reigns upon the Caspian Sea and in the army of the Caucasus. Transport vessels, having troops and war *matériel* on board, pass incessantly between Astrakan and the port of Baku. The new lieutenant-general of the Caucasian provinces, Prince Bariatinski, has received fuller powers than his predecessors. He has lately inspected, on its way to its destination, the flotilla of the Caspian Sea, which has been considerably increased. Meanwhile the Russian Government neglects nothing in replacing the war *matériel* consumed during the late war, and continues to refill the exhausted magazines."—p. 26.

And—

"Without undertaking to decide the large question at issue (the invasion of India by Russia), I shall assume the feasibility of invasion to be established, and merely observe that now more than ever should we be on the watch, for the Russian and Indian dominions are twelve hundred miles nearer to each other than when the invasion of Afghanistan took place."

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11. *Esquisse Géographique du Bassin de la Mer d'Aral, &c. Lue à la Société de Géographie de Paris.* Par M. Eugène Lamansky, Secrétaire de la Société Impériale Géographique de Russie. Paris: Martinet. 1858.

From such a source as M. Lamansky we ought to expect the most correct information respecting the subject here treated of, since, as he himself informs us at p. 13 of his pamphlet, "Most of the narratives of the travellers who have recently visited the khanats adjoining the Russian territories have been published by the Geographical Society of St. Petersburg." The author first points out that little or nothing was known of the Sea of Aral in Western Europe down to the commencement of the eighteenth century, when Peter the Great, then a resident in Paris, made known to the Academy of Sciences some important details concerning the hydrography of Central Asia which had previously been acquired by his countrymen. In 1741 Mouravine was sent by the Russian government to survey the shores of the Sea of Aral, of which he subsequently produced a chart; since which time the extension of colonization from Russia, and multiplied journeys of travellers in that direction, have materially added to our knowledge of the inland sea in question. Colonel Berg in 1825-6 ascertained the existence of an elevated region on its western side, continuous with the spurs of the Ural on the north, the height of which has rendered it very improbable that the Aral and Caspian Seas have ever been united during the historic period—at any rate toward their northern portions. M. Lamansky affords us a general description of the great basin named Turan, in which the Sea of Aral lies—bounded as it is by the chain of heights already mentioned on the west, by the Hindú Kúsh and its offsets on the south, the Bolor Tagh on the east, and finally on the north by the southern slope of the Ural Mountains, and being identical with the greater portion of what is called Independent Tartary. His description of the Sea of Aral itself is the following:—"The Sea of Aral is situated between lat. 43° 42' 41" and 46° 44' 42" N., and long. 58° 18' 47" and 61° 46' 4" E. (of Greenwich). It is almost equal in length and breadth, excepting a part of it on the north-east, which stretches deep into the country, forming a large bay nearly surrounded by land, and bearing the name of the 'Little Sea,' to distinguish it from the principal body of water called the 'Great Sea.' The superficies of the latter is about 1000 square geographical miles. Its depth in its centre is fifteen fathoms, and goes on augmenting towards its western shore; near its islands, as well as towards its north, east, and south shores, the depth gradually diminishes. The borders of this sea present the appearance of a gloomy desert: in summer, except in some places on the eastern and southern sides, they are uninhabited; in winter the Kirghises encamp especially on the northern and eastern sides, and on some of the islands. The northern coast is composed in a great part of argillaceous and saline formations (*terrain salin*), which rise 100 to 300 English feet above the level of the sea, and, declining to the north, sink into the great sandy plain of Barsouki. The western coast is sharply defined by the limits of the Oust-Oust plateau. Under the name of Oust-Oust is known the isthmus which separates the Caspian from the Sea of Aral. This isthmus has the form of a level plain, the height of which is nearly 600 feet above the surface of the two (?) seas. It is limited by abrupt and lofty banks. The officers attached to the expedition of Colonel Berg, Messrs. Anjou, Lagoskine, and Duhamel, determined barometrically the difference of level between the Caspian Sea at Mertvoi-Koultouk and the Sea of Aral, the distance between the two being 245 kilomètres (152 miles) direct east, in the latitude of 42° N. The result established that the level of the Sea of Aral is 117·6 English feet above that of the Caspian. The level of the latter sea, as decided by the labours of the astronomers Fuss, Sawitsch, and Sabler, of the Academy of St. Petersburg, is 84 English feet below that of the Black Sea. The respective differences in the level of the three seas are,—Black Sea, 0; Caspian Sea, −84 feet; Sea of Aral, +37·6 feet. On the south and east of the Sea of Aral the shores are low, sandy, and covered in parts with reeds and briers" (pp. 19-21). The great rivers flowing into the Sea of Aral, the Syr-Daria (Jaxartes) and its affluents, and the Amou-Daria or Jyhoon (Oxus), are next described; and the rest of the treatise is occupied with descriptions of the khanats of Kokan, Khiva, and Bukhara, their inhabitants, state of civilization, and political organization. In this portion the following passage occurs:—"In 1850 the Khan of Khiva formed a battalion of regular troops with a certain number of pieces of cannon. Eye-witnesses who have seen the artillery at practice have said that, out of a hundred artillerymen, not one could hit a mark fifty paces distant; and it was not an ordinary target that was used, but an isolated height. The Khivans are, however, pretty tolerable marksmen with their long muskets. As to the total number of troops, it is said that the Khan of Khiva can bring into the field nearly 25,000 horsemen armed with sabres and lances: of this number, however, not more than 5000 are furnished with muskets. The bravery of the Khivans, as of all other

Asiatic people, depends on the success of their first charge; but a single Congreve-rocket is sufficient to put the whole army to flight" (p. 35). Such being the character of the force of a leading state of Independent Tartary, it can scarcely be expected to resist with success the advance of Russian domination into that region, which has long been steady and progressive.

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12. *Die Erdkunde von Asien von Carl Ritter.* Vol. IX. Part I. Asia Minor. Berlin, 1858.

The sixth division of the third book (Western Asia) of the eighteenth part of Ritter's copious Geography of Asia—a tome consisting of 1024 closely-printed pages—is appropriated to Asia Minor; but even this abundance of letterpress does not exhaust the subject in the hands of the Prussian geographer, since the work before us constitutes only the first of three volumes, the rest of which are to follow. It treats of little more than the northern shores and declivity of the peninsula of Asia Minor, after a general description of the central table-land, and of its great streams, the Tchoruk, Yezil Irmak (Iris), Kizil Irmak (Halys), Sakaria (Sangarius), the river of Trebizond, &c.; and its twenty-third and last chapter is devoted to a consideration of the chief towns and trade of the southern coast of the Black Sea. In addition to full descriptions of the physical geography and commercial resources of this region, the archæology of the northern part of Asia Minor receives its full share of notice in accounts of the troglodytic caves and sculptures on the south bank of the Halys and elsewhere, the ruins of Boghaz, those of the ancient Pessinus (Bala Hissar) with the temple of Cybele, the Greek colony of the ancient Trapezus (Trebizond), &c.; and digressions are introduced on the Angora wool and goats' hair, the culture of saffron around Zafaran-boly, and the tunny fishery of Sinope. At the end are an appendix from the pen of Kiepert, and engravings of Assyrian monuments in Asia Minor with explanatory notes. The work is continued after the same plan which has characterised it throughout; and it is not too much to say that when terminated it will be a complete encyclopædia of all that is known concerning the great continent that has been the storehouse of all the nations which have peopled the earth.

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13. *Vespuce et son Premier Voyage.* Par M. F. A. de Varnhagen, Memb. de la Société de Géographie. Paris: Martinet, 1858.

The author remarks that since the publication of the illustrious Humboldt's *Examen Critique de l'Histoire Géographique du Nouveau Continent*, the consideration due to Amerigo Vespucci has been restored to his memory. His claims to the applause of posterity rest upon four recorded voyages—two made in the service of Portugal, and the other two (which were previous) in that of Spain; but the first of the latter named has been frequently regarded as apocryphal. The author is, however, convinced of its certainty. He says it cannot be doubted "that Vespucci left Spain on the 10th of May, 1497; and having sailed a thousand leagues west-south-west, passing consequently across the Antilles, found himself after 37 days in lat. 16° N., and long. 75° W., of the Canaries. He then discovered the new continent some days before Cabot. He had attained the Bay of Honduras. . . . Thence he followed, in sight of land, the coast of Yucatan, towards the north-east, for two days, and at length, on discovering a safe anchorage for vessels, cast anchor half a league from land. He disembarked 40 men, who made some barter with the natives, He continued to sail for some days, frequently landing, and at length arrived at a port, in the midst of which was seen an assemblage of houses built in the water, and defended with drawbridges. According to the relation of Vespucci, this port was 80 leagues south of that where the fleet subsequently arrived, and which was placed under the Tropic of Cancer. We are inclined to think that this port with its dwellings built in the water was no other than Vera Cruz, with the Isle of Sacrifices, and that which Grijalva called San Juan de Ulua, and of which Herrera gives an idea in no wise contradicting the impression that Vespucci had received in likening it to Venice. Thence he sailed to another port 80 leagues distant, well watered, abounding in fish and in birds, amongst which Vespucci mentions parroquets. This port was situated in a country which, according to the Italian text by Bandini and Canovai, is designated by the name of Lariab."

This Lariab, M. Varnhagen contends, is *Caria* or *Cariah*, disfigured by the transcriber, and is the port of Tampico. From this point, he says, Vespucci proceeded northward, "coasting along an extent estimated at 870 leagues. By a comparison of his narrative with other documents, it would appear that he well recognised the Mississippi, and that he pursued his course to Florida, the southern extremity of which peninsula he reached towards the end of April, 1498. From this point he must have passed through the Bahama channel, and continued to coast along the shores of the United States for more than thirty days, until after a navigation of thirteen months, consequently in the month of June, we find him not far from the port called by Vespucci the best in the world. This port could be nowhere except in the Gulf of St. Lawrence. After thirty-seven days it was decided to leave it; but the natives having a feud with certain others who inhabited an island a hundred leagues distant, the navigators considered themselves obliged to take part with the former in return for the treatment they had received. After a sail of seven days east-north-east they arrived at an island named Iti. They took some prisoners there, a part of whom were given over to the natives of the Gulf, who returned to their own country. Notwithstanding the resemblance of the names, we must be careful not to confound, as has been done, this isle of Iti, surrounded by other islands, inhabited or desert, with that of Haiti or Hispaniola. This expedition did not return to Cadiz until the month of October, 1499, after a voyage of eighteen months."

The author cites various proofs in favour of the authenticity of the first voyage of Vespucci; he afterwards directs his attention to overthrow objections made against it; and he quotes an important document in support of his positions, in the shape of a letter, dated in 1506, which was discovered by Ranke at Vienna, and published by Humboldt at p. 157 of the fifth volume of his *Examen Critique*. In addition, he affords us at the end of his pamphlet facsimiles of three notes attributed to Columbus, and bearing closely on the subject. The ultimate conclusion to which M. Varnhagen arrives is, that Vespucci undoubtedly accompanied Pinzon and Solis, and with a fleet of four ships, between 1497 and August, 1498, discovered and explored all the eastern coast of North America from Yucatan and the Gulf of Mexico to the most northern parts of the United States.

14. *Notes on Ghilan.*[*] By Keith E. Abbott, Esq., H.M. Consul, Tehran.

Ghilan is a narrow strip of country situated on the south-western side of the Caspian, and enclosed by a lofty range of mountains, measuring from 6000 to 9000 feet above the sea's level. It is, I believe, about 32 agatches, or 144 miles, in length, including that portion of Tālish which still belongs to Persia; in the broadest part it is called about 11 agatches, or 50 miles, in width; but in some of the parts I visited, the mountains, which occupy probably half the superficies of the province, approach to within 5 or 6 miles of the sea, and I believe still nearer in the northernmost portion of the country. The whole province, with the exception of the summits of the loftiest mountains and such parts as have been cleared away for cultivation, appears to be covered with wood. The immense quantity of rain which falls, the want of drainage, the dense forests and luxuriant vegetation, render the whole of the level country a morass. The climate, under such circumstances and in such a low latitude, must inevitably be unhealthy, and to strangers it is almost fatal during the hot months.

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[*] *See* Paper by General Monteith, vol. iii. Journal R.G.S.—Ed.

The natives of other provinces of Persia can seldom be tempted to expose themselves to it at that season; in winter and in spring and autumn fatal diseases are not so common, but the exceeding dampness and relaxing nature of the atmosphere render a sojourn there far from desirable from the frequency of colds and rheumatisms, and from the pains in the limbs and knees, which a prolonged residence entails. From the beginning of June to the end of September the flat country is reputed to be almost uninhabitable by a European or other stranger to the climate. The neighbouring mountains, however, offer a salubrious refuge during this period; but a person is there in complete seclusion, and cut off from intercourse with the neighbourhood by the distance and the badness of the roads. Few of the inhabitants of the flat country can take advantage of these fine retreats in the unhealthy season, because all hands are then occupied with the production of silk. The natives of the low country have almost all a sickly appearance; a healthy countenance was a rarity, of which, even in winter, I saw but few examples. The mountaineers are less sallow, but the fine, hardy, and healthy look of the Azerbijanee of the opposite side of the mountains is seldom seen amongst them.

The language of Ghilan proper is the Ghilaïk, a dialect of the Persian, which is spoken with great rapidity, and is less sonorous than the Persian of other parts. The Tālish district, of which the Russians now possess the largest division, bounds Ghilan on the north. The inhabitants are represented as rude and brutal, much given to plunder and murder, but are a hardy and active race, especially those who live in the highlands. Their language is another dialect of the Persian, and I am informed that it has been ascertained to contain much more of the Pehlivi than either the Ghilaïk or the language of Masanderan. Of twenty substantives which I noted of the Ghilaïk, only two varied from the modern Persian; in the same number of words, and of the same meaning, in the Tālish language, there were only nine which corresponded with the Persian either exactly or approximately; the great difference in the former dialect appears to be in the verbs and in the pronunciation.

The principal places in Ghilan are Resht (its capital), Enzilli, Fomen, and Lahijan. I did not visit either of the latter two, but I believe that Lahijan is the largest, and not greatly inferior in size to Resht itself, which contains probably about 3000 houses and 15,000 to 20,000 inhabitants. Resht may be called a clean town; its bazaars are extensive, though not showy; the chief display in them consists of Russian hardware, glassware, and earthenware, and some English manufactures. The streets are paved with small stones; in wet weather, however, they are rendered very disagreeable to passengers, owing to the great and unequal projection of the roofs, from which the drippings descend in torrents, and which it is difficult to avoid. The jungle which covers Ghilan reaches to the very houses of Resht; these are generally of burnt brick and tiled, and are usually composed of a ground floor and upper story.

The caravanserais are numerous, but are not fit places for a European; in fact, there is only one set apart for Christians, into which I fancy a European would be admitted, and that is of a wretched description.

The houses in the country are much scattered, and seldom, as far as I saw, present the appearance of regular villages, and they are generally so much screened from view by the jungle that one is frequently not aware of their neighbourhood. They are usually neat and clean within, and instead of carpeting the inhabitants have beautiful mats, the reeds for which they obtain in abundance all over the flat country.

The population of Ghilan is at present small; I have heard it estimated as low as 100,000, but this appears to me to be an undervaluation. It is very difficult, however, to form an idea of its probable amount from the peculiar nature of the country. The dense forest which covers it, by concealing from the view of the traveller the habitations of the people, except such as are immediately on his line of route, precludes his forming any estimate from what comes under his observation, and there are no public records to which to refer. Previous to the dreadful plague of 1830 the province was well peopled, but full two-thirds of the population would appear to have been carried off by that calamity, from which the country has never recovered. A person with whom I was conversing on the subject told me that of 40 individuals of his own family and relations living here, 36 fell victims to the scourge; the remaining four had fled from the country.

Many thousand labourers from the Khalkhal districts of the western side of the Tâlish mountains find employment here during winter in the clearing and cultivation of land, hewing of wood, felling of timber, building, and other employments requiring bodily strength and great exertion, for which their weak and sickly constitution seems to incapacitate the natives of Ghilan. These labourers return to their homes in spring, for they cannot endure in summer the fatal climate of this low and swampy country.

The natives of Ghilan are notorious for their bigotry, ignorance, and prejudice; they have seldom seen Europeans, and those they are most acquainted with have generally been Russians. The care these prejudiced people take to avoid contact with a Christian as he passes them in the streets in rainy weather (when he is looked upon as particularly unclean) is perfectly ridiculous. In Azerbijan this prejudice is now almost effaced, but the Ghilaiks have yet to learn a lesson which a visit from their Russian neighbours may one day teach them.

The food of the people is very simple and light. Rice and fish are the principal articles; both are the produce of the province, the latter being found in abundance in all the numerous streams which intersect the country, as well as in the lake or backwater of Enzilli, and in the sea. These fisheries are all rented, but much of the produce is doubtless taken without being paid for. Besides these the people have abundance of fine poultry, and horned cattle, like the Indian species; with a hump over the shoulder, but mutton is not commonly to be met with, except in autumn, I believe, when all classes are in the habit of consuming meat. The sheep are brought from the mountains, where they are pastured, and from the plains of Mogan. Wild fruit grows everywhere in abundance, but none is cultivated, which is, I believe, the reason of its being extremely unwholesome. I should except oranges, lemons, and limes, which were once extensively cultivated until a few years ago, when nearly all the trees were destroyed by an extraordinarily severe winter, and the fruit is now scarce and dear. The vines are allowed to climb up the [illegible]ms of the forest, as in some parts of Turkey: the juice of the grape affords [illegible]elicious kind of treacle, called dowshaub, which is eaten with dry boiled [illegible] Neither fat nor butter is used in cookery, nor is any sort of bread [illegible]xcept in the towns, the people generally believing it to be injurious to their health in this climate. Wheat and barley are cultivated only in trifling quantities, near the mountains; almost all that is required for consumption in the towns is brought from other provinces. The poorer classes give their horses rice in the husk, but those who can afford it procure barley, and rice-straw is used instead of barley-straw. Almost every provision is dear when compared with its value in other parts of Persia, except the few articles which are raised in the province.

The soil of Ghilan appears in some parts to be a rich vegetable stratum on one of sandstones and pebbles; it is probable, from this circumstance, and from marine shells being frequently found underground, that at some period the low country has been covered by the sea.

The flora of the province is exceedingly rich. Amongst the trees the oak and birch are in abundance, but the former is seldom of great girth. A species of very thorny acacia grows also all over the country. The pomegranate and other wild fruit-trees which abound must give to the forest a charming appearance at certain seasons.

I am informed that in the woods the tiger, panther, wild boar, jackal, and marten are found, and probably there are many other animals which I was not informed of. In the rivers is found the otter.

There is a great variety of birds in the woods. The pheasant is very plentiful, also the woodcock in its season; and the lake and its reedy islands, and the marshes, harbour myriads of wild-fowl of many kinds. In summer the swarms of gnats and flies render a residence in the country far from agreeable.

The complaints common in Ghilan are fevers and agues, rheumatisms, small-pox, leprosy, and other cutaneous diseases. The latter are said to have been much more common a few years since than at present, a circumstance which I have not heard accounted for. The dreadful plague which visited the province some years ago may perhaps have purged the country of many of these disorders by carrying off those who were afflicted with them; but this is a mere conjecture.

The roads throughout Ghilan are perhaps the worst it is possible to conceive; those around Resht have been left in the most extraordinary state of neglect and disorganization purposely and avowedly with the object of keeping off invasion. It was once suggested to one of the governors by the agent of a neighbouring power that great advantage would result from the repair of the roads and cleansing of the bed of a small stream which flows near Resht. Both these were undertaken, but so great was the jealousy of the people, that the governor's conduct was immediately represented at court, and he was reprimanded. Since then the roads and river have again become as impracticable as before, and the former can scarce be termed roads, as it is with the utmost difficulty that any beast of burthen can pass them. They are, however, the best defences which such a country can possess whilst in the hands of a semi-barbarous people, and they on one occasion many years since proved the safety of the capital of Ghilan. A Russian force attempted to reach that town by the Peeree Bazaar road. It would appear that with infinite difficulty they succeeded in getting half-way between Peeree Bazaar and Resht, a distance of five or six miles, dragging along some artillery; but here they encountered a brisk fire from irregular troops sent against them. Entangled in the thickets, and retarded by the wretchedness of the roads, the invaders were deliberately picked off by the ambush into which they had fallen; and they are said to have lost about 500 men, were forced to retreat, and have never since repeated the attempt.

The Caspian appears to be very shallow on the south-western side for many furlongs from the shore, and I observed several single-masted vessels riding at anchor securely at about 10 or 15 miles out at sea. The Russian Government sends a vessel every year to survey the coasts of the Caspian, as the soundings are continually altering; their sailors are made to serve alternately in this sea and in the Baltic.

The Caspian is considered a stormy sea; and there is no doubt that a great deal of the rain and snow with which Ghilan is at certain seasons deluged comes from seawards; but to such vessels as navigate the Caspian almost any boisterous weather must be perilous. I understand that some Russian officers, who a short time since were employed to ascertain the relative heights of the Caspian and Black Seas, found that the former was 96 French feet lower than the level of the latter. The observations which I took of the barometer at the Caspian did not give this result, but the instrument had got out of order on the journey, and, though I repaired it, there was not much dependence to be placed on the observations made with it. The waters of this sea, which I tasted at various parts of the coast, appeared to contain very little salt. This may have arisen in part from the vicinity of many small streams, but I believe that it is not in any part very briny.

Enzilli contains 300 to 400 houses and shops, and is the only seaport on the coast of Ghilan. It is situated on the extreme point of a singularly narrow and long strip of sand, which, with one of similar shape advancing from the east and nearly joining it, almost separates the lake or backwater of Enzilli from the Caspian, leaving a passage between them of about 200 yards wide. The western tongue on which Enzilli stands is about 15 miles in length, of various widths, but in some parts not above 150 yards across: it is covered with swamp and jungle. The anchorage is within this tongue of land, and between it and a long island in the lake, the intermediate channel being deep enough to admit of ships of 250 tons burden, when partly laden, lying close to the shore, and people can step from it on board. There is ample accommodation for all the vessels which visit this port, but the larger class are obliged to discharge part of their cargoes into boats at sea before they can cross the bar at the entrance of the lake. Many sandbanks reaching almost to the water's surface very much obstruct the passage to the anchorage. There appears to be very little depth of water in the lake, and probably not in any part above 6 fathoms. The surface is not often much ruffled by storms, but the boats of Enzilli, being of slight build and small beam, do not venture on it in blowing weather. The extent of the lake is called 6 agatches by 4, or 27 by 18 miles, but I should think it was more. Its saltness is scarce perceptible, and indeed the boatmen commonly drink it. It swarms with fish of various kinds, particularly the máhee sefeed (a species of carp, I believe).

Enzilli, the seaport of Ghilan, through which a considerable traffic is carried on, possesses not a single caravanserai or other fit place of accommodation either for goods or passengers. A stranger arriving there without friends or recommendations to people would be exceedingly ill off, particularly in winter, where he might be detained by stress of weather (if on his way to Resht); for several days he would scarce find a shelter for himself, and probably none for his horses.

I could not obtain an exact account of the vessels which frequent the port of Enzilli. Of the largest, measuring from 100 to 250 or 300 tons, there are said to be about 10 or 12 annually from Astrakan. From Báku, Salian, and Lankeran, the greater part are large boats of various rigs; and I was told that from 50 to 60 of these visit Enzilli during the year. I should have thought, however, the number would have been greater; for when I was at Enzilli there were between 20 and 30 vessels of all descriptions in the harbour; and many may be supposed to make more than one trip in the year to this port, though there is no account kept of them, and the people seemed to have no exact notion of their real number. The greater part come from Báku, laden with naphtha, of which there is an extensive consumption in the countries bordering on the Caspian, the lower classes commonly burning it in their lamps. It is extremely cheap, a maun shakee, or 13 lbs., being worth at Enzilli 12 to 14 shahees, or about 8*d.* sterling.

The Russian mercantile marine in the Caspian is said to amount to about 1000 vessels of all descriptions; the limited trade of this sea not requiring so many, freights are exceedingly low.

The village of Peeree Bazaar, the shipping-place of all goods passing between Resht and Enzilli, is situated on a small river at about 3 miles from the lake. It possesses neither stores for goods nor accommodation for travellers; the only shelter to be obtained for the former is an open shed, which hardly screens them from the weather. Here they have to await the chance arrival of boats from Enzilli, which come generally only when they have obtained a lading. The road from Peeree Bazaar to Resht lies through the jungle, and, if road it may be called, can scarce be exceeded in badness by anything with such a name. Though the actual distance is perhaps not more than 5 or 6 miles, such is the extreme difficulty of the road, that it requires 3 to 4 hours to perform it with a horse lightly burthened. The river of Mângandeh, a small stream about 12 yards wide, which passes near Resht, and falls into the lake, offers an easy channel of communication with Enzilli; but the same reasons which induce the government to neglect the repairs of the Peeree Bazaar road, render it also their policy to impede the free navigation of this little stream, which, from want of attention, has its course blocked up in various parts by fallen trees and mudbanks. In summer, when the water is low, on account of these obstructions boats cannot ascend the stream, I believe; and in winter the current is so strong, that it takes a day to ascend from the lake to near Resht, a distance of about 10 miles.

In conclusion, I would observe that Ghilan, though in wretched hands and kept in the most shameful state of neglect, is, in proportion to its extent, the richest province of Persia. Its inhabitants appear to possess a great deal of wealth. Among the highest classes there are large fortunes, and traders with 2000 to 5000 tomauns capital are very numerous. The lowest class, though not supposed generally to possess more in coin than they require to purchase necessaries with, appear to live comfortably on half their crops of rice (the other half being the property of the landlord), their poultry, and the produce of their cows, together with the wild fruits which grow everywhere, and the fish of the numerous streams, the lake, and sea. The government derives a yearly revenue of 200,000 tomauns, or about 100,000*l.* sterling, from the province, including the customs and rent of the fisheries, which together amount to 45,000 tomauns, or about 22,500*l.*; but probably half as much again is paid in voluntary contributions by the principal people of the province to the court for objects of self-interest, and there are many pensioners in the province who have grants of lands and villages made them by government in return for services.

15. *Remarks on the Undulatory Motion of the Sea and its Currents.*[*] By Commendatore ALESSANDRO CIALDI.

FIVE principal propositions form the subject of the present notice:—

1st. The translation of the liquid mass in the undulating motion of the waves on the open sea when the wind is violent.

2nd. The absence of any notable translation in the said undulating mass when the velocity of the wind is not more than 7 or 8 mètres per second.[†]

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[*] Cenni sul Moto ondoso del Mare, e sulle Correnti di Esso. 4°. Roma, 1856.

[†] Mètre = 39·37 inches.

3rd. The translation of the mass of the waves when they have not free scope underneath, although the wind is moderate.

4th. The number of mètres in depth to which the action of the waves is communicated.

5th. The superiority of the effects of the real motion of the waves over the littoral and tidal currents, with respect to the translation of detritus or obstructive materials.

From the general system of ideas developed by the author we gather that to attribute a motion to the liquid mass of waves is not conformable to the hydrodynamic principles generally established. Thus the propositions contained in his first, third, and fifth questions cannot be explained by the mechanical theory of fluids, but he demonstrates that this theory, often contradicted by experience, leaves much to be desired if applied to the undulating motion of the sea. To this effect the author has, in his *Introduction*, given a description of the hypotheses or theories promulgated by the distinguished authors who have preceded him, whence results such a variety of views as to give confidence in his own opinion. However, the author appears thoroughly convinced that the above theory is based upon truth. Thus, when extraordinary causes do not intervene, the elements established by that theory in the phenomenon are not altered, and consequently the latter acts according to the law established by the theory.

But when a cause like that of a violent and long-continued wind alters the pre-established system in the undulatory motion, the author cannot but admit a notable motion in the liquid mass. He holds it to be indisputable that the wind can communicate to the waves a real motion of translation on the surface of the water, and his conclusions are not deduced from experiments made in the quiet of the study, but from facts verified in the immensity of the sea. The author has therefore adduced a great number of such facts in the twelfth paragraph. Besides which, reason suggests to him that a liquid mass in equilibrium on one side, receiving continuous or intermittent impulses, must also receive continuous motions of translation from the opposite part. Now, if this argument and the whole series of facts collected are not sufficient to convince any one of the important influence that a given force of wind has upon the liquid mass, the author requires explanations of those extraordinary translations experienced by ships in certain latitudes where the current is known or where none exists (§ 13). The facts subsist; we feel the necessity of explaining them in order to prevent their fatal effects. But hitherto, as far as the author knows, no one has occupied himself sufficiently with this matter.

In consequence of the materials gathered in the twelfth paragraph, it was easy for the author to compile the contents of the thirteenth section; and the example of the English vessel *Winchester* and that of the French frigate *Venus*, adduced in the above paragraph, are for him a clear explanation of the sought-for cause of that extraordinary translation or drifting. The number of examples, says the author, might be considerably increased, but, in a paper bearing the simple title of 'Hints,' he thinks that what he has said on the subject in §§ 12 and 13 may prove sufficient. Now, if this proposition, which embraces the first question, somewhat differs from the theoretical law of the undulatory motion, seeing that the powerful causes in certain cases produce an alteration, he believes that, in these exceptional cases, the said proposition may be admitted among those which are tolerably proved, and therefore deserve to be seriously examined. When such exceptional causes do not exist, namely, when the wave is not struck by a wind stronger than seven mètres of velocity in a second of time, the author agrees with the theory, and therefore, in the second question, he does not admit a notable motion of translation in the waves, and he combats the contrary opinion of De Tessan, Alan

Stevenson, Paoli, and De Coligny; and, in the 15th paragraph, he adduces a great number of facts to prove the mistake under which they labour. The author therefore drawing a marked distinction between the state of a wave driven by an impetuous wind and that of a wave acted on by a slight breeze, equally combats the views of those authors who deny that there is any motion of the particles of the liquid mass in waves, and those who always admit its existence.

Let us now pass on to the proposition which forms the subject of the third question. In the 19th paragraph the author begins to treat of the phenomena which must occur when the wave strikes the bottom of the sea with its base. The 20th paragraph describes this phenomenon, and the 21st shows its existence, deduced from a series of facts which he considers very conclusive. The hypothesis that in the wave raised by the wind near the shore the same thing may arise that occurs in the tidal wave (§ 21), seems to the author to have so much analogy and probability that he believes himself obliged to admit one of the following consequences: either that such hypothesis is the expression of what actually takes place in nature, or that the reality, whatever it may be, must be so nearly parallel to the truth as to admit of one mode of expression common to both.

It results therefore from what precedes, that if his proposition be not susceptible of any other explanation, it must be taken into consideration, otherwise we should form a very restricted idea (on the authority of Sir J. F. W. Herschel, says the author) of the merit and importance of the hypothesis; but following the relation of facts, he gathers his conviction that the hypothesis by him presented amounts to a certainty. Nevertheless, he himself concludes that it would not be useless to collect a greater number of proofs in order to obtain universal assent to his convictions.

From the remaining part of the 21st paragraph the author prepares the arguments which are to serve him in supporting the proposition which forms the fifth and last question.

But before proceeding to it he stops to prove the volume and velocity of the waves, the depth to which their action is communicated, and what their power may be.

The coasts of islands and continents receive their configuration from the mass of waters in motion. Some distinguished authors assert that it results from the littoral or tidal currents; whereas Mr. Cialdi believes that such configuration is the work of the waves. The paragraphs 22, 23, and 24, referring to a long series of analogous proofs, treat of the volume of the waves, their vigorous footing proving their immense power at depths hitherto not acknowledged by the learned, and induce the author to conclude that the waves are the principal instruments employed by nature in excavating and filling up the shores of the sea.[*] With this important series of facts the author undertakes to examine the doctrine of Montanari, and thus passes on to the *second part* of his work.

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[*] From the facts gathered by Mr. Cialdi it results that the waves can attain 11 mètres (36 feet English) in height, 20 mètres (66 feet) of velocity in one second of time, and 300 mètres (984 feet) of amplitude from crest to crest. Their power near the surface of the sea is of 30,000 kilogrammes per square mètre (6145 lbs. per square foot English); their action is communicated still perceptibly at the depth of 200 mètres (656 feet); and when arrived at a bottom of 34 mètres (111 feet) of water they break.

In the Mediterranean the waves attain only 9 mètres (29·5 feet) in height, 10 (32·8 feet) mètres of velocity in a second, and their power has been found, 7 mètres above the surface of the sea, to amount to 16,000 kilogrammes per square mètre (3265 lbs. per square foot), which is still perceptible at a depth of 60 mètres (197 feet). They begin in that sea to break when they meet the bottom at a depth less than 12 mètres (39 feet).

According to Mr. Cialdi, Montanari's doctrine considered *per se* is far from solid, and a small number of facts adduced would suffice to prove it erroneous. But that doctrine being supported by the most celebrated men who have treated the subject of the motion of waters, he feels the necessity of extreme circumspection in his deductions while unhesitatingly refuting the same. He therefore endeavours to enter gradually into the development of the question in hand, with the paragraphs from 25 to 35, and as he proceeds he gathers in new facts against the defenders of the said doctrine; so that at the 37th paragraph he seems to think that he has annihilated it by weight of the facts and by dictates of reason, and he sees rising on its ruins the new law of *sand-shiftings*, the principles of which were already indicated by Castelli, Boscowich, and De Fazio, but remained neglected on account of the prevailing theory of Montanari. This new law of sand-shifting is held by the author as an axiom.

The author was under this conviction when he became acquainted with the excellent 'Considerations on the *Protrusion* of Shores and on the Sand Accumulations in the Ports of the Adriatic, applied to the Establishment of a Port in the Pelusian Bay,' by the celebrated Paleocapa.

It is easy to perceive that, those 'Considerations' contradicting the two principal propositions which form the basis of almost the whole edifice raised by Captain Cialdi, he saw himself placed under the necessity either of renouncing the authority of all the facts adduced in his work, or of making an *appendix* to the same, which, based on the same facts and on others omitted for brevity's sake, should prove the exactness of his arguments. After mature reflection he adopted the second alternative; and we gather from the Appendix he has published that a more thorough examination of the question has given, according to his opinion, still greater evidence to all that he had previously enunciated.

In this Appendix he besides avails himself of the opportunity of adverting to the intended Pelusian port; he applies there his theory, and suggests a few modifications in the piers which are to form that harbour.

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LONDON: PRINTED BY W. CLOWES AND SONS, STAMFORD STREET, AND CHARING CROSS.